SFF Committee documentation may be purchased (see 2.3).
SFF Committee documents are available by FaxAccess at 408-741-1600

SFF Committee

SFF-8480 Specification for

HSSDB9 (High Speed Serial DB9) Connections

Rev 2.1 March 19, 1999

Secretariat: SFF Committee

Abstract: This specification defines the physical interfaces and performance requirements for HSSDB9 balanced copper connectors, retention schemes, high speed performance parameters, and other physical dimensions and requirements to be used for Fibre Channel, Gigabit Ethernet and other duplex serial balanced copper applications. Other uses of this general purpose connection system are also possible. This system uses the familiar DB9 interface specified in xxxxxxx but adds the requirements to allow satisfactory operation at Gigabit and multi-gigabit data transmission rates.

The controlling document for the dimensional values is EIA PN-????, an Electronic Industries Association Standard. The relevant parts of this EIA document are included in this specification for easy reference.

This document provides a common specification for systems manufacturers, system integrators, and suppliers of magnetic disk drives. This is an internal working document of the SFF Committee, an industry ad hoc group.

This document is made available for public review, and written comments are solicited from readers. Comments received by the members will be considered for inclusion in future revisions of this document.

The description of a connector in this document does not assure that the specific component is actually available from connector suppliers. If such a connector is supplied it must comply with this specification to achieve interoperability between suppliers.

Support: This document is supported by the identified member companies of the SFF Committee.

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EXPRESSION OF SUPPORT BY MANUFACTURERS

The following member companies of the SFF Committee voted in favor of this industry specification.

Berg
Compaq
Fujitsu CPA
Harting Elect
Hitachi Cable
Madison Cable
Methode
Molex
Toshiba America
Unisys

The following SFF member companies voted no on the technical content of this industry specification.

Amphenol
DEC

The following member companies of the SFF Committee voted to abstain on this industry specification.

Adaptec
AMP
DDK Electronics
Dell
ENDL
Framatome
IBM
Matsushita
Maxtor
Pioneer NewMedia
Quantum
Ricoh
Seagate
Western Digital
Winchester Elect

The following member companies of the SFF Committee voted to forward this industry specification to an accredited standards body.

Fujitsu CPA

If you are not a member of the SFF Committee, but you are interested in participating, the following principles have been reprinted here for your information.

PRINCIPLES OF THE SFF COMMITTEE

The SFF Committee is an ad hoc group formed to address storage industry needs in a prompt manner. When formed in 1990, the original goals were limited to defining de facto mechanical envelopes within which disk drives can be developed to fit compact computer and other small products.

Adopting a common industry size simplifies the integration of small drives (2 1/2" or less) into such systems. Board-board connectors carrying power and signals, and their position relative to the envelope are critical parameters in a product that has no cables to provide packaging leeway for the integrator.

In November 1992, the SFF Committee objectives were broadened to encompass other areas which needed similar attention, such as pinouts for interface applications, and form factor issues on larger disk drives. SFF is a forum for resolving industry issues that are either not addressed by the standards process or need an immediate solution.

Documents created by the SFF Committee are expected to be submitted to bodies such as EIA (Electronic Industries Association) or an ASC (Accredited Standards Committee). They may be accepted for separate standards, or incorporated into other standards activities.

The principles of operation for the SFF Committee are not unlike those of an accredited standards committee. There are 3 levels of participation:

- Attending the meetings is open to all, but taking part in discussions is limited to member companies, or those invited by member companies
- The minutes and copies of material which are discussed during meetings are distributed only to those who sign up to receive documentation.
- The individuals who represent member companies of the SFF Committee receive documentation and vote on issues that arise. Votes are not taken during meetings, only guidance on directions. All voting is by letter ballot, which ensures all members an equal opportunity to be heard.

Material presented at SFF Committee meetings becomes public domain. There are no restrictions on the open mailing of material presented at committee meetings. In order to reduce disagreements and misunderstandings, copies must be provided for all agenda items that are discussed. Copies of the material presented, or revisions if completed in time, are included in the documentation mailings.

The sites for SFF Committee meetings rotate based on which member companies volunteer to host the meetings. Meetings have typically been held during the ASC T10 weeks.

The funds received from the annual membership fees are placed in escrow, and are used to reimburse ENDL for the services to manage the SFF Committee.

Foreword

When 2 1/2" diameter disk drives were introduced, there was no commonality on external dimensions e.g. physical size, mounting locations, connector type, connector location, between vendors.

The first use of these disk drives was in specific applications such as laptop portable computers in which space was at a premium and time to market with the latest machine was an important factor. System integrators worked individually with vendors to develop the packaging. The result was wide diversity, and with space being such a major consideration in packaging, it was not possible to replace one vendor's drive with a competitive product.

The desire to reduce disk drive sizes to even smaller dimensions such as 1.8" and 1.3" made it likely that devices would become even more constrained in dimensions because of a possibility that such small devices could be inserted into a socket, not unlike the method of retaining semiconductor devices.

The problems faced by integrators, device suppliers, and component suppliers led to the formation of an industry ad hoc group to address the marketing and engineering considerations of the emerging new technology in disk drives. After two informal gatherings on the subject in the summer of 1990, the SFF Committee held its first meeting in August.

During the development of the form factor definitions, other activities were suggested because participants in the SFF Committee faced problems other than the physical form factors of disk drives. In November 1992, the members approved an expansion in charter to address any issues of general interest and concern to the storage industry. The SFF Committee became a forum for resolving industry issues that are either not addressed by the standards process or need an immediate solution.

At the same time, the principle was adopted of restricting the scope of an SFF project to a narrow area, so that the majority of documents would be small and the projects could be completed in a rapid timeframe. If proposals are made by a number of contributors, the participating members select the best concepts and uses them to develop specifications which address specific issues in emerging storage markets.

Those companies which have agreed to support a documented specification are identified in the first pages of each SFF Specification. Industry consensus is not an essential requirement to publish an SFF Specification because it is recognized that in an emerging product area, there is room for more than one approach. By making the documentation on competing proposals available, an integrator can examine the alternatives available and select the product that is felt to be most suitable.

Suggestions for improvement of this document will be welcome. They should be sent to the SFF Committee, 14426 Black Walnut Ct, Saratoga, CA 95070.

The development work on this specification was done by the SFF Committee, an industry group. The membership of the committee since its formation in 1990 through July 1998 has included the following organizations:

3M
Adaptec
All Best Technique
Alps Tohoku
AMP
Amphenol Interconnect
Apple Computer
Areal Technology
Aztech Systems
Berg Electronics
Burndy
Circuit Assembly
Cirrus Logic
Compaq Computer
Conner Peripherals
Dell Computer
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Seagate Technology
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Silicon Systems
Sony
Specialty Electronics
Stocko Connectors
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Texas Instruments DMSG
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Wearnes Hollingsworth
Wearnes Peripherals
Wearnes Technology
Western Digital
Winchester Electronics
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If you are not receiving the documentation of SFF Committee activities or are interested in becoming a member, the following signup information is reprinted here for your information.

Annual SFF Committee Membership Fee	$ 1,800.00
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SFF Committee --

HSSDB9 (High Speed Serial DB9) Connections

1. Scope

This specification defines the terminology and physical requirements for HSSDB9 connections, complete connectors and interface requirements on the termination side. Balanced, shielded duplex copper connections are desirable in Fibre Channel, Gigabit Ethernet and other external (to the system enclosure) shielded systems where intra enclosure connections are needed. There is a single mating interface for all versions.

The HSSDB9 system allows applications that need to use the following features a way to do so interoperably.

(1) Familiar multi-wipe connector style with known properties
(2) Compatible with a very broad range of media types including the larger gauge wires that are desirable for longer distances
(3) Large enough to accommodate considerable additional circuitry in the backshell yet small enough to work with PC option cards
(4) Excellent mechanical robustness
(5) Positive jack screw retention.
(6) Continuous metal shell around the contacts (shield)

The controlling document for the dimensional values is EIA PN-????, an Electronic Industries Association Standard. The relevant parts of this EIA document are included here for easy reference and since Fibre Channel and other standards only specify the mating interface and have no specific performance requirements the EIA document and this document become the public specifications.

The function of the specific contact positions are defined by Fibre Channel and other standards. Some of those definitions will be replicated in this document.

The HSSDB9 system was derived from its familiar parent, the DB9 connector, which has been in service for a number of years in a broad range of applications. Every variant of HSSDB9 has the physical space for 9 contact positions. However, there are four cases described where the contact population and mechanical function of the positions are different:

1. only 4 specific positions are populated
2. only 8 specific positions are populated with contacts for active signals and one specific receptacle contact position has no hole in the housing - this blocks a contact on the plug (in an incompatible variant) and acts as a mechanical key
3. only 8 specific positions are populated with contacts for active signals and one specific receptacle contact position has a hole but the hole is filled with an insulating insert - this insert blocks a contact on the plug (in an incompatible variant) and acts as a mechanical key
4. all 9 positions are populated with contacts for active signals – no special keying

DB9's are not historically associated with high speed serial applications e.g. one popular use is serial mouse connections. The ability of the basic DB9 to be adapted to support very high data rates is more a function of the connector design in parts of the connector not part of the actual mating interface area. The termination side design parameters in the connector itself and the details of the termination (e.g. wire or printed circuit board) technique determine the high speed performance in addition to the mating interface.

By adjusting the backshell design on cable assemblies one can produce a look and feel with the HSSDB9 that invites the expectation of high speed applications.

The physically robust design and relatively small size enable the HSSDB9 to be usable in all applications from notebooks to data centers. The connector has a straightforward construction which does not rely on advanced materials or processes.

This document specifies the requirements on the mating and termination sides of the connectors to enable functional multiple sourcing of the complete connectors. The construction of the connectors between the mating and termination sides are not controlled by this document other than that implied by the performance requirements.

Fibre Channel, Gigabit Ethernet, P1394, SSA and the emerging NGIO and Future I/O standards presently incorporate requirements on the copper interconnect used to transmit Gigabit signals. Since the HSSDB9 connector system may form part of this interconnect it is also subject to these requirements. The HSSDB9 may or may not be called out specifically for use with the above referenced applications in the respective standards documents; this document, with incorporated references, will allow the HSSDB9 to be used in these applications whether it is specifically called out or not.

In an effort to broaden the applications for storage devices, an ad hoc industry group of companies representing system integrators, peripheral suppliers, and component suppliers decided to address the issues involved.

The SFF Committee was formed in August, 1990 and the first working document was introduced in January, 1991.

1.1 Description of Clauses

Clause 1 contains the Scope and Purpose.

Clause 2 contains Referenced and Related Standards and SFF Specifications.

Clause 3 contains the list of Figures and Tables

Clause 4 contains the General Description

Clause 5 contains the Definitions and Conventions

Clause 6 defines the Connector Descriptions and Dimensions.

2. References

The SFF Committee activities support the requirements of the storage industry, and it is involved with several standards.

2.1 Industry Documents

The following interface standards are relevant to this Specification.

- X3.230-1994 FC-PH (Fibre Channel Physical Interface)
- X3.297-xxxx FC-PH-2 (Fibre Channel Physical Interface -2)
- X3.303-xxxx FC-PH-3 (Fibre Channel Physical Interface -3)
- EIA PN-xxxx
- IEEE 802.3z Proposed Gigabit Ethernet standard (1000-BASE-T)

2.2 SFF Specifications

There are several projects active within the SFF Committee. At the date of printing document numbers had been assigned to the following projects. The status of Specifications is dependent on committee activities.

F = Forwarded	The document has been approved by the members for forwarding to a formal standards body.
P = Published	The document has been balloted by members and is available as a published SFF Specification.
A = Approved	The document has been approved by ballot of the members and

	is in preparation as an SFF Specification.
C = Canceled	The project was canceled, and no Specification was Published.
D = Development	The document is under development at SFF.
E = Expired	The document has been published as an SFF Specification, and the members voted against re-publishing it when it came up for annual review.
i = Information	The document has no SFF project activity in progress, but it defines features in developing industry standards. The document was provided by a company, editor of an accredited standard in development, or an individual. It is provided for broad review (comments to the author are encouraged).
s = submitted	The document is a proposal to the members for consideration to become an SFF Specification.

Spec #	Rev	List of Specifications as of October 2, 1997
SFF-8000		SFF Committee Information
SFF-8001i	E	44-pin ATA (AT Attachment) Pinouts for SFF Drives
SFF-8002i	E	68-pin ATA (AT Attachment) for SFF Drives
SFF-8003	1.1	SCSI Pinouts for SFF Drives
SFF-8004	E	Small Form Factor 2.5" Drives
SFF-8005	E	Small Form Factor 1.8" Drives
SFF-8006	E	Small Form Factor 1.3" Drives
SFF-8007	E	2mm Connector Alternatives
SFF-8008	E	68-pin Embedded Interface for SFF Drives
SFF-8009	3.1	Unitized Connector for Cabled Drives
SFF-8010	E	Small Form Factor 15mm 1.8" Drives
SFF-8011i	E	ATA Timing Extensions for Local Bus
SFF-8012	E	Power Connector Pin Dimensions
SFF-8013	E	ATA Download Microcode Command
SFF-8014	C	Unitized Connector for Rack Mounted Drives
SFF-8015	E	SCA Connector for Rack Mounted SFF SCSI Drives
SFF-8016	C	Small Form Factor 10mm 2.5" Drives
SFF-8017	1.7	SCSI Wiring Rules for Mixed Cable Plants
SFF-8018	E	ATA Low Power Modes
SFF-8019	E	Identify Drive Data for ATA Disks up to 8 GB
SFF-8020i	2.6	ATA Packet Interface for CD-ROMs
SFF-8028i	E	- Errata to SFF-8020 Rev 2.5
SFF-8029	E	- Errata to SFF-8020 Rev 1.2
SFF-8030	1.7	SFF Committee Charter
SFF-8031		Named Representatives of SFF Committee Members
SFF-8032	1.2	SFF Committee Principles of Operation
SFF-8033i	E	Improved ATA Timing Extensions to 16.6 MBs
SFF-8034i	E	High Speed Local Bus ATA Line Termination Issues
SFF-8035i	E	Self-Monitoring, Analysis and Reporting Technology
SFF-8036i	E	ATA Signal Integrity Issues
INF-8037i	1.0	Intel Small PCI SIG
INF-8038i	1.0	Intel Bus Master IDE ATA Specification
SFF-8039i	E	Phoenix EDD (Enhanced Disk Drive) Specification
SFF-8040	1.2	25-pin Asynchronous SCSI Pinout
SFF-8041	C	SCA-2 Connector Backend Configurations
SFF-8042	C	VHDCI Connector Backend Configurations
SFF-8043	1.0	40-pin MicroSCSI Pinout
SFF-8045	3.7	40-pin SCA-2 Connector w/Parallel Selection
SFF-8046	2.7	80-pin SCA-2 Connector for SCSI Disk Drives
SFF-8047	C	40-pin SCA-2 Connector w/Serial Selection
SFF-8048	C	80-pin SCA-2 Connector w/Parallel ESI
SFF-8049	2.0	80-conductor ATA Cable Assembly
INF-8050i	1.0	Bootable CD-ROM
INF-8051i	0.2	Small Form Factor 3" Drives

INF-8052i	0.91	ATA Interface for 3" Removable Devices
INF-8053i	4.2	GBIC (Gigabit Interface Converter)
INF-8055i	2.0	SMART Application Guide for ATA Interface
SFF-8056	1.0	50-pin 2mm Connector
SFF-8057	1.2	Unitized ATA 2-plus Connector
SFF-8058	1.2	Unitized ATA 3-in-1 Connector
SFF-8059	1.0	40-pin ATA Connector
SFF-8060	1.1	SFF Committee Patent Policy
SFF-8061	1.1	Emailing drawings over the SFF Reflector
SFF-8065	C	40-pin SCA-2 Connector w/High Voltage
SFF-8066	C	80-pin SCA-2 Connector w/High Voltage
SFF-8067	1.8	40-pin SCA-2 Connector w/Bidirectional ESI
SFF-8068	1.0	Guidelines to Import Drawings into SFF Specs
SFF-8069	1.0	Fax-Access Instructions
INF-8070i	1.1	ATAPI for Rewritable Removable Media - Part 1
INF-8071i		ATAPI for Rewritable Removable Media - Part 2
INF-8072i		ATAPI for Rewritable Removable Media - Part 3
SFF-8080	1.2	ATAPI for CD-Recordable Media - Part 1
SFF-8081		ATAPI for CD-Recordable Media - Part 2
SFF-8082		ATAPI for CD-Recordable Media - Part 3
SFF-8090	0.99	ATAPI for DVD (Digital Video Data)
SFF-8200	1.1	2 1/2" drive form factors (all of 82xx family)
SFF-8201	1.3	2 1/2" drive form factor dimensions
SFF-8212	1.2	2 1/2" drive w/SFF-8001 44-pin ATA Connector
SFF-8300	1.1	3 1/2" drive form factors (all of 83xx family)
SFF-8301	1.2	3 1/2" drive form factor dimensions
SFF-8302	1.1	3 1/2" Cabled Connector locations
SFF-8332	1.2	3 1/2" drive w/80-pin SFF-8015 SCA Connector
SFF-8337	1.2	3 1/2" drive w/SCA-2 Connector
SFF-8342	1.3	3 1/2" drive w/Serial Unitized Connector
SFF-8400	C	Very High Density Cable Interconnect
SFF-8420	0.2	HSSDC-1 Shielded Connections
SFF-8430	0.0	Mini-MT Duplex Optical Connections
SFF-8441	11.0	VHDCI Shielded Configurations
SFF-8451	7.0	SCA-2 Unshielded Connections
SFF-8480	0.0	HSS (High Speed Serial) DB9
SFF-8500	1.1	5 1/4" drive form factors (all of 85xx family)
SFF-8501	1.1	5 1/4" drive form factor dimensions
SFF-8508	1.1	5 1/4" ATAPI CD-ROM w/audio connectors
SFF-8551	1.2	5 1/4" CD-ROM 1" High form factor
SFF-8610	x.x	SDX (Storage Device Architecture)

2.3 Sources

Copies of ANSI standards or proposed ANSI standards may be purchased from Global Engineering.

15 Inverness Way East	800-854-7179 or 303-792-2181
Englewood	303-792-2192Fx
CO 80112-5704	

Copies of SFF Specifications are available by FaxAccess or by joining the SFF Committee as an Observer or Member.

14426 Black Walnut Ct	408-867-6630x303
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ELECTRONIC COPIES

The increasing size of SFF Specifications has made FaxAccess less practical as a way to obtain large documents.

Although SFF does not maintain a Web site, electronic copies of documents are made available via CD_Access, a service which provides copies of all the specifications plus SFF reflector traffic. CDs are mailed every 2 months as part of the document service, and provide the letter ballot and paper copies of what was distributed at the meeting as well as the meeting minutes.

The status of SFF Specifications is summarized in SFF-8000, which can be obtained over FaxAccess. Document subscribers and members are automatically updated every two months with the latest specifications.

If this is the last page of an SFF Specification, it means that the latest copy of this specification is not available via FaxAccess. To obtain a copy, you may join the SFF Committee as a Member or an Observer, and sign up for either paper or electronic copies.

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1. Tables of Figures and Tables

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1.1 TABLE OF TABLES

2. General Description

The presently standardized connection systems available for use with external Fibre Channel, SSA, Gigabit Ethernet, P1394 and the emerging standards NGIO and Future I/O require that the system integrator or designer choose between alternatives that are incompatible and of different size and pin style than the HSSDB9. The new HSSDB9 connection system is based on round pin and socket style contacts while the other alternatives all use leaf style contacts. This round style contact offers multiple wipe for each contact, is based on proven connector technology and has minimal risk of damage to the pins because of the very significant mechanical strength.

HSSDB9 connectors find their most important application where electrical performance for signals having signal edge rates of 200 ps and less and where positive retention and mechanical robustness is needed. This covers many critical special applications and is compatible with virtually all of the external inter-enclosure applications for gigabit serial applications that use balanced copper media for transmission.

The shield contact is required to make contact before any of the signal contacts upon insertion and to break contact only after all contacts are separated upon removal. This ensures that any ground potential differences between enclosures are first exposed to the shield thereby minimizing the risk of damaging the sensitive input and output stages of the transceivers when the signal contacts are mated.

Three different variants are described where the number of active contact positions is the variable.

3. Definitions and Conventions

3.1 Definitions

For the purpose of SFF Specifications, the following definitions apply:

Advanced grounding contacts: Connector pins that make first and break last and are capable of carrying power ground return currents and performing electrostatic discharge. Other terms sometimes used to describe these features are: grounding pins, ESD contacts, grounding contacts, static drain, and pre-grounding contacts.

Alignment guides: Connector features that preposition insulators prior to electrical contact. Other terms sometimes used to describe these features are: guide pins, guide posts, blind mating features, mating features, alignment features, and mating guides

Board Termination Technologies: surface mount single row, surface mount dual row, through hole, hybrid, straddle mount

Cable Termination: The attachment of wires to the termination side of a connector. Schemes commonly used in the industry are IDC (Insulation Displacement Contact), IDT (Insulation Displacement Termination), wire slots, solder, weld, crimp, braise, etc.

Contact mating sequence: Order of electrical contact during mating/unmating process. Other terms sometimes used to describe this feature are: contact sequencing, contact positioning, make first/break last, EMLB (early make late break) staggered contacts, and long pin / short pin.

Fixed: Used to describe the gender of the mating side of the connector that accepts its mate upon mating. This gender is frequently, but not always, associated with the common terminology "receptacle". Other terms commonly used are "female" and "socket connector". The term "fixed" is adopted from EIA standard terminology as the gender that most commonly exists on the fixed end of a connection, for example, on the board or bulkhead side. In this document "fixed" is specifically used to describe the mating side gender illustrated in Figure 1.

Free: Used to describe the gender of the mating side of the connector that penetrates its mate upon mating. This gender is frequently, but not always, associated with the common terminology "plug". Other terms commonly used are "male" and "pin connector". The term "free" is adopted from EIA standard terminology as the gender that most commonly exists on the free end of a connection, for example, on the cable side. In this document "free" is specifically used to describe the mating side gender illustrated in Figure 1.

Frontshell: That metallic part of a connector body that directly contacts the backshell or other shielding material that provides mechanical and shielding continuity between the connector and the cable media. Other terms sometimes used to describe this part of a cable assembly are: housing, nosepiece, cowling, and metal shroud.

Free Board: A connector that uses a free gender mating side and a termination side suitable for any of the printed circuit board termination technologies

Fixed Board: : A connector that uses a fixed gender mating side and a termination side suitable for any of the printed circuit board termination technologies

Height: Distance from board surface to farthest overall connector feature

Mating side: The side of the connector that joins and separates from the mating side of a connector of opposite gender. Other terms commonly used in the industry are mating interface, separable interface and mating face.

Offset: An alignment shift from the center line of the connector

Optional: This term describes features which are not required by the SFF Specification. However, if any feature defined by the SFF Specification is implemented, it shall be done in the same way as defined by the Specification.

Reserved: Where this term is used for defining the signal on a connector pin its actual function is set aside for future standardization. It is not available for vendor specific use. Where this term is used for bits, bytes, fields and code values; the bits, bytes, fields and code values are set aside for future standardization. The default value shall be zero. The originator is required to define a Reserved field or bit as zero, but the receiver should not check Reserved fields or bits for zero.

Right Angle: A connector design for use with printed circuit board assembly technology where the mating direction is parallel to the plane of the printed circuit board

Single row: A connector design for use with surface mount printed circuit board assembly technology where the termination side points are arranged in one line

Single sided termination: A cable termination assembly style and a connector design style where only one side of the connector is assessable when attaching wires. This style frequently has IDC termination points that point in the same direction.

Straddle mount: A connector design style and a printed circuit board design style that uses surface mount termination points on both sides of the board. The connector is frequently centered between the top and bottom surfaces of the board.

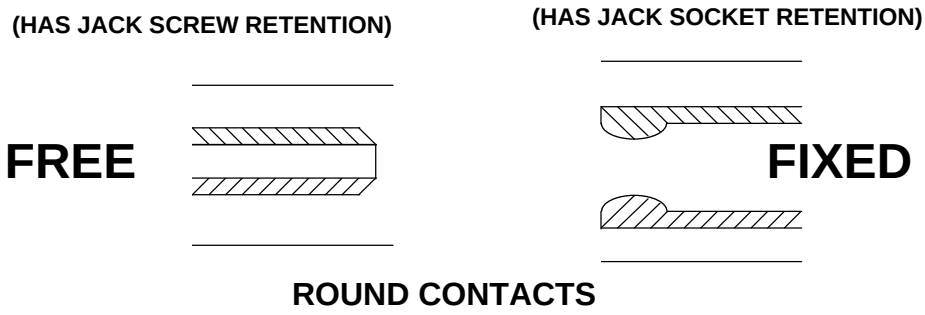
Straight: A connector design for use with printed circuit board assembly technology where the mating direction is perpendicular to the plane of the printed circuit board

Surface mount: A connector design and a printed circuit board design style where the connector termination points do not penetrate the printed circuit board and are subsequently soldered to the printed circuit board

Termination side: The side of the connector opposite the mating side that is used for permanently attaching conductors to the connector. . Due to pin numbering differences between mating side genders the termination side shall always be specified in conjunction with a mating side of a specific gender. Other terms

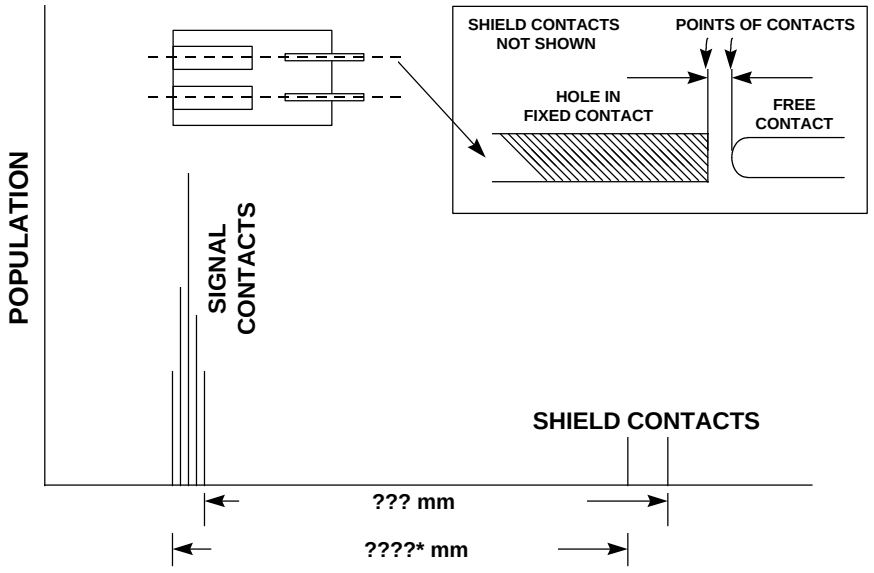
commonly used in the industry are: back end, non-mating side, footprint, pc board side, and post side

Through hole: A connector design and a printed circuit board design style where the connector termination points penetrates the printed circuit baord and are subsequently soldered to the printed circuit board



THE FIXED GENDER IS USED ON THE DEVICE SIDE EXCEPT WHEN USED WITH WIRE TERMINATION

Figure 1 - Mating side gender definition



7

Figure 2 - Shield / contact sequencing

Annex A contains some explanation and rationalization for the terminology used by EIA for the description of connectors. Since these terms apply largely to the use

of the connectors and not directly to the properties of the connectors themselves there is some confusion possible when the connectors are used in certain ways. For example it is perfectly acceptable to use the fixed gender on a cable (thereby making it "free" in the application). This use does not change the name of the gender to "free". Even though the use may not map to the terminology in all cases these terms are adopted in this document for convenience of reference to the EIA documents. Readers are encouraged to consider the most common applications for the gender when mentally mapping the terminology to the connector properties.

3.2 Conventions

The American convention of numbering is used i.e., the thousands and higher multiples are separated by a comma and a period is used as the decimal point. This is equivalent to the ISO convention of a space and comma.

American:	ISO:
0.6	0,6
1,000	1 000
1,323,462.9	1 323 462,9

4. Connector descriptions:

4.1 Complete connector options

The complete connectors listed in this section are supported in this document. The overall view of the mating sides are shown in Figure 3 and Figure 4.

FIXED MATING SIDE CONNECTORS (used on the device side except when used with cable terminations) (Refer to Figure 16 for mating side specifications):

CONNECTOR NAME (each specification covers 4, 8 and 9 position variants)	OVERVIEW	OUTLINE	TERMINATION SIDE
FIXED CABLE	Figure 10	Figure 10	NA
FIXED BOARD RIGHT ANGLE THRU HOLE VERSION 1	Figure 5	Figure 5	Figure 18
FIXED BOARD RIGHT ANGLE THRU HOLE VERSION 2	Figure 6	Figure 6	Figure 18
FIXED BOARD STRAIGHT VERSION 1	Figure 7	Figure 7	Figure 18
FIXED BOARD STRAIGHT VERSION 2	Figure 8	Figure 8	Figure 18
FIXED BOARD STRADDLE MOUNT	Figure 9	Figure 9	Figure 20

FREE MATING SIDE CONNECTORS (used on the side that has the retention release)(refer to Figure 17 for mating side specifications):

CONNECTOR NAME (each specification covers 4, 8 and 9 position variants)	OVERVIEW	OUTLINE	TERMINATION SIDE
FREE CABLE	Figure 15	Figure 15	NA
FREE BOARD RIGHT ANGLE THRU HOLE VERSION 1	Figure 11	Figure 11	Figure 19
FREE BOARD RIGHT ANGLE THRU HOLE VERSION 2	Figure 12	Figure 12	Figure 19
FREE BOARD STRAIGHT THRU HOLE	Figure 13	Figure 13	Figure 19
FREE BOARD STRADDLE MOUNT	Figure 14	Figure 14	Figure 21

The relevant figures from EIA PN-???? are duplicated for reference below:
Only the physical dimensions and a table of the most important performance requirements are included.

4.2 Performance and compatibility requirements

HSSDB9 shielded connectors shall meet the connector performance requirements specified in EIA PN-????. Some of these are summarized in Table 1.

In addition the HSSDB9 system (including all terminations and relevant neighboring interconnect) shall meet the requirements for high speed electrical performance described in SFF 8410.

[need to modify this table for HSSDB9]

Table 1 - Some performance requirements for HSSDB9 connectors

Parameter	Requirements
Rated Voltage	30 VDC
Current Ratings	1 Ampere (1 Contact Energized)
Insulation Resistance	500 MΩ Maximum Initial
Ambient Temperature	-55°C - +85°C
Mating Cycles	500
Contact Resistance non-shield contacts	35 mΩ Maximum Initial
Contact Resistance - shield contacts	42 mΩ Maximum Initial

4.3 Functional definitions

Table 2 - Position function definitions (for fixed gender used on device)

Position	Symbol	Description
1	Tx+	+ signal line connected to device transmitter
2	Power	d. c. power supplied from device
3	Fault	signal to device that attached circuitry is not working properly
4	Key	may be used as a mechanical key (free contact cannot mate if housing has no hole) - function not specified for 9-position application
5	Rx+	+ signal line connected to device receiver
6	Tx-	- signal line connected to device transmitter
7	ODIS	signal from device to external circuitry to disable circuitry functions
8	Ground	Power ground connection inside the device
9	Rx-	- signal line connected to device receiver

Cable assembly note: position 1 connected to position 5 on opposite end, position 6 connected to position 9 on opposite end, all other positions may not be connected from end to end within a cable assembly.

The physical compatibility requirements for use with printed circuit boards are given in Table 3. Board thicknesses and/or assembly processes that require tail lengths other than that given in Table 3 are not compatible with the connectors defined in this document.

Table 3 - Printed circuit board compatibility requirements

TERMINATION SIDE STYLE	PRINTED CIRCUIT BOARD THICKNESS

	MIN (MM / INCHES)	MAX (MM /INCHES)
SURFACE MOUNT *	1.01 / 0.040	1.27 / 0.050
THROUGH HOLE A (0.070 TAILS)	0.87 / 0.034	1.13 / 0.044
THROUGH HOLE B (0.110 TAILS)	1.45 / 0.057	1.75 / 0.069
THROUGH HOLE C (0.125 TAILS)	2.21 / 0.087	2.51 / 0.099
THORUGH HOLE D (0.160 TAILS)	3.03 / 0.119	3.33 / 0.125
THROUGH HOLE E (0.180 TAILS)	3.44 / 0.135	4.20 / 0.165
THROUGH HOLE SOLDERLESS **	**	**
STRADDLE MOUNT	0.96 / 0.038	1.32 / 0.052?
* This dimension is required to accommodate board retention features that penetrate the board		
** The connector pin properties shall be designed to work with these board specifications and are not otherwise specified Finished hole size: 0.72 / 0.028 min 0.88 / 0.035 max (same as Thru hole size) Board Thickness: 1.57 / 0.062 min 3.17 / 0.125 max Solder thickness: per IPC hole plating specification Copper thickness: per IPC hole plating specification		

[Need to modify for HSSDB9]

[DO WE WANT TO ADD DETAILS ON BOARD LAYOUT REQUIREMENTS FOR HIGH SPEED OPERATION - APPLIES TO ALL FOOTPRINTS AND TERMINATION SIDE DESIGNS]

4.4 General physical considerations

Figure 3 and Figure 4 show the general view of the mating connectors. Three different position counts are available: 9, 8, and 4. For convenience only the 8-position variants will be shown in the specifications. The 9-position variant may be created by adding contacts and housing holes to the 8- position variant at position 4. The 4-position variant may be created by removing the functionality in the 8- position variant from positions 2, 3, 7, and 8.

Note that details of how the number of non-functional positions are created may have a significant impact on the high speed electrical performance of the connector due to the different amount of metal present in critical areas of the connector. There are at least seven different ways to create mated connectors that have less than 9 functional positions. Table 4 shows these methods.

Each method of disabling the positions constitutes a different variant of connection and requires additional and separate testing to validate performance.

Table 4 - Methods for creating non-functional positions

		Fixed connector		
		no housing holes / no contacts	housing holes / no contacts loaded	housing holes / contacts loaded
Free connector	no housing holes / no contacts	Method 1	Method 2	Method 3
	housing holes / no contacts loaded	Method 4	Method 5	Method 6
	housing holes / contacts loaded	connectors cannot mate	Method 7	Not applicable -- positions will be functional

Using loaded contacts in non functional positions (methods 3, 6, and 7) is not recommended for either gender due to the risk that loaded contacts may accidentally be present in the other gender. Also, the difference in electrical performance between housings that have no holes or unpopulated holes in the housings is likely to be relatively small compared to the differences when contacts are present.

To reduce the risk of degraded electrical performance it is recommended that HSSDB9 connectors be tested both with mating partners that have no housing holes and with those that have unpopulated housing holes.

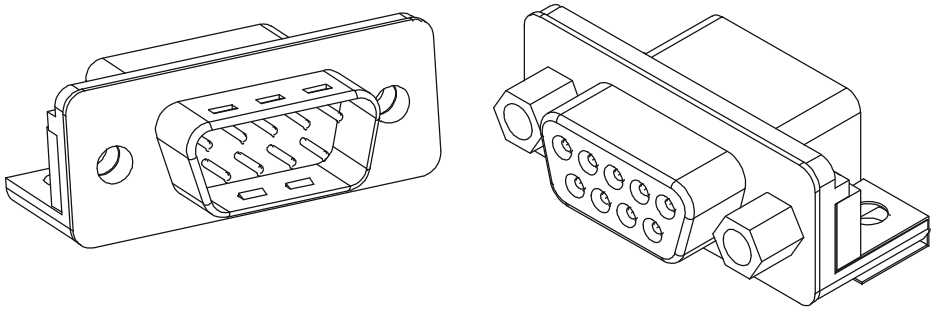


Figure 3 - General view of mating sides (9 position)

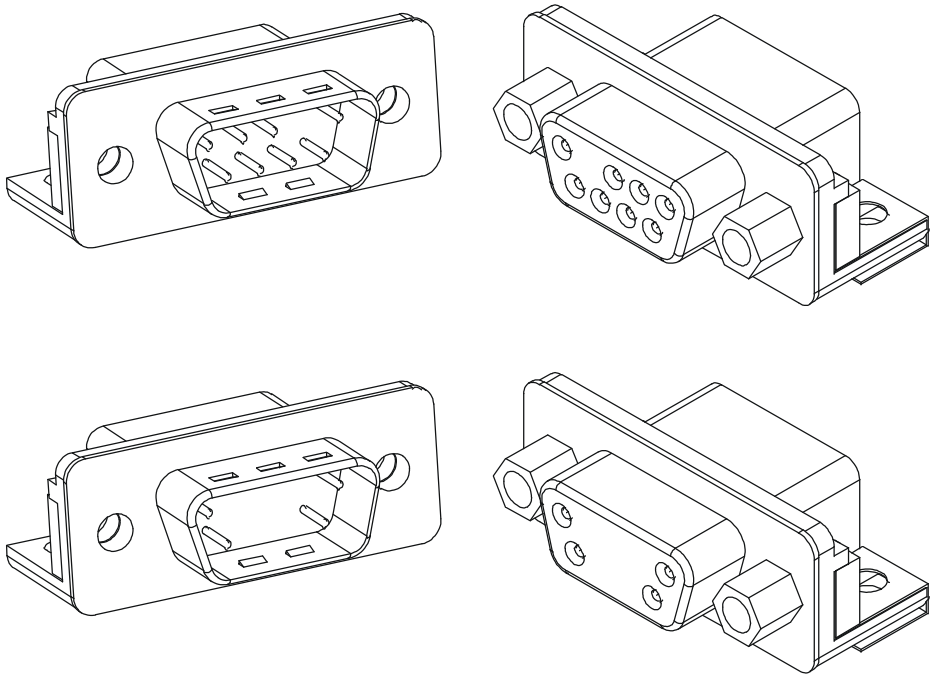


Figure 4 - General view of mating sides (8 position / 4 position)

4.5 Dimensional requirements

The drawings in this section use the dimensioning conventions described in ANSI-Y14.5M, Dimensioning and Tolerancing. All dimensions are in millimeters.

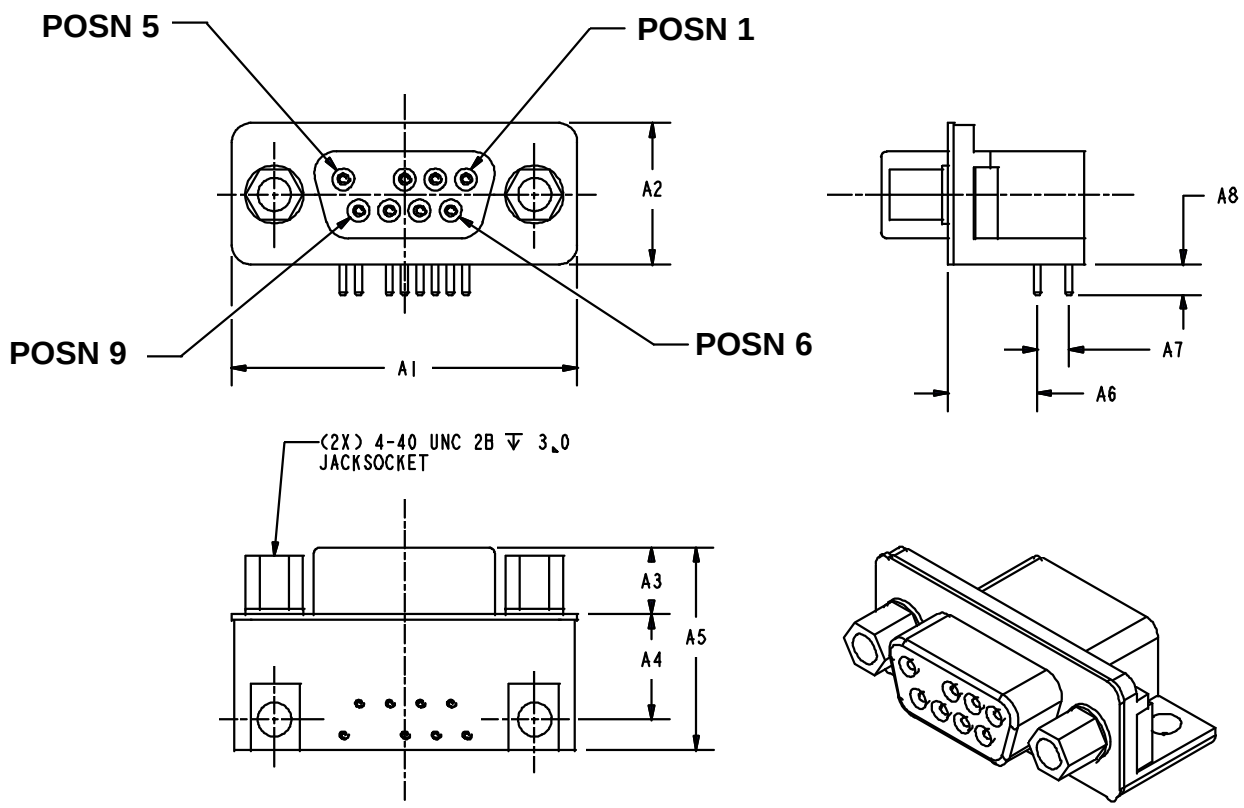


Figure 5 - Fixed board right angle through hole (version 1) overview and outline dimensions

A1	A2	A3	A4	A5	A6	A7	A8
30.81	12.55	5.90	9.53	18.60	8.08	2.84	2.79

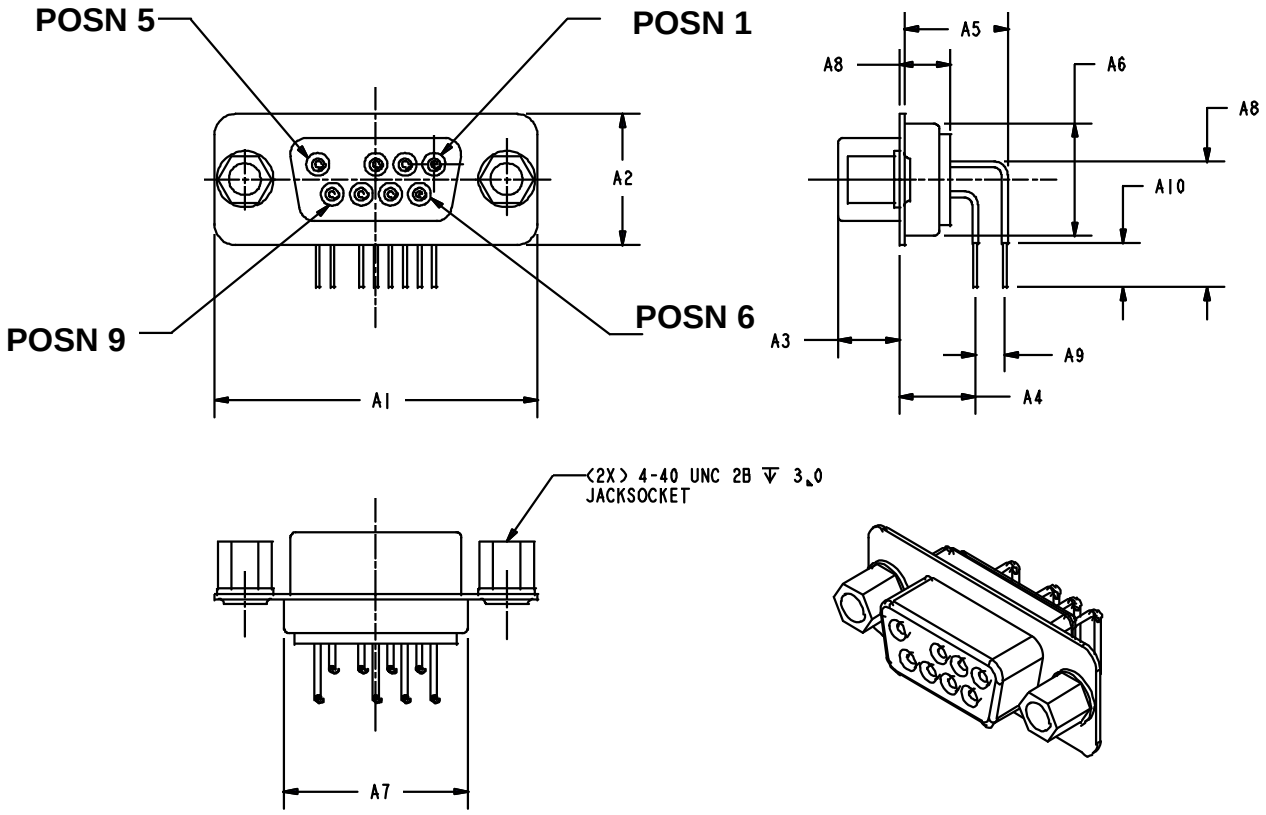


Figure 6 - Fixed board right angle through hole (version 2) overview and outline dimensions

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
30.81	12.55	5.90	10.72	13.56	10.72	19.28	6.2	2.84	4.20

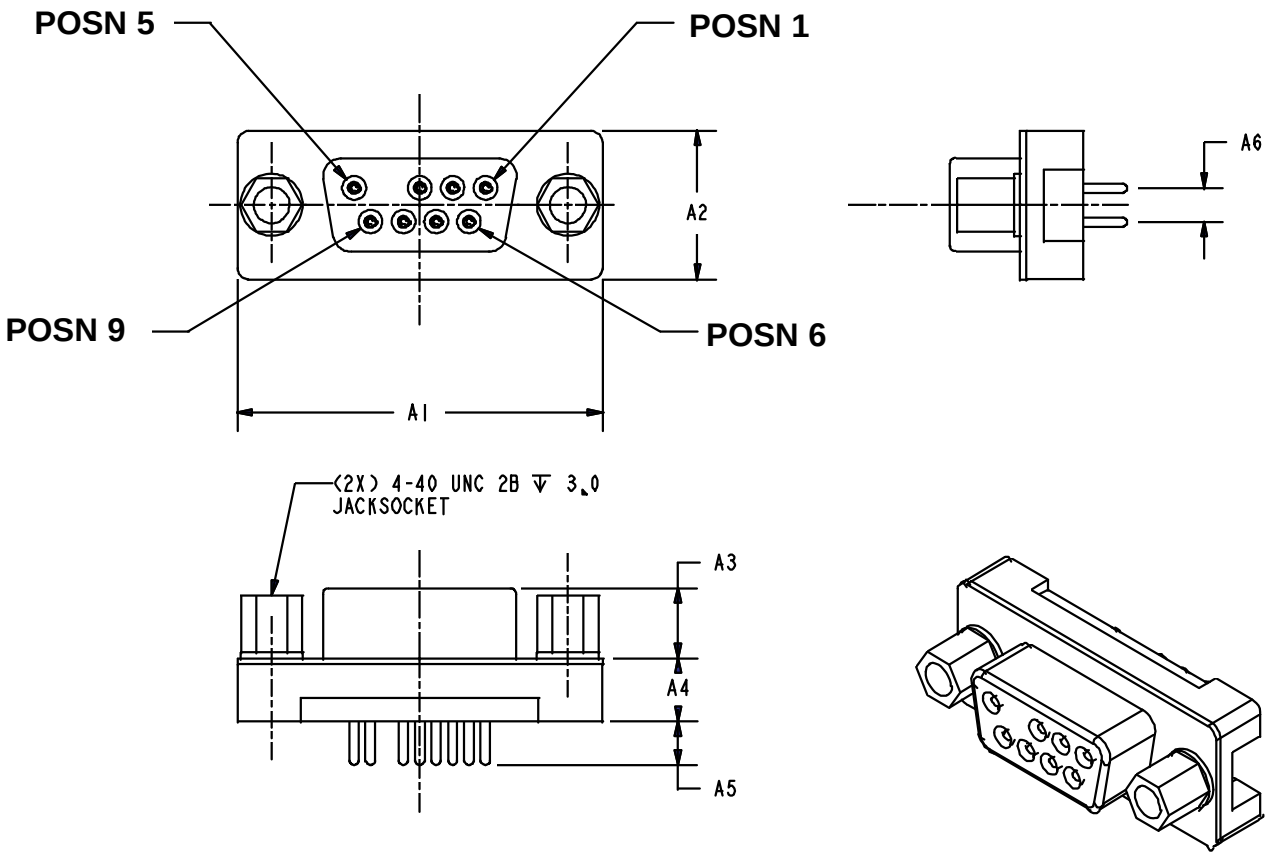


Figure 7 - Fixed board straight through hole (version 1) overview and outline dimensions

A1	A2	A3	A4	A5	A6
30.81	12.55	5.90	5.33	3.70	2.84

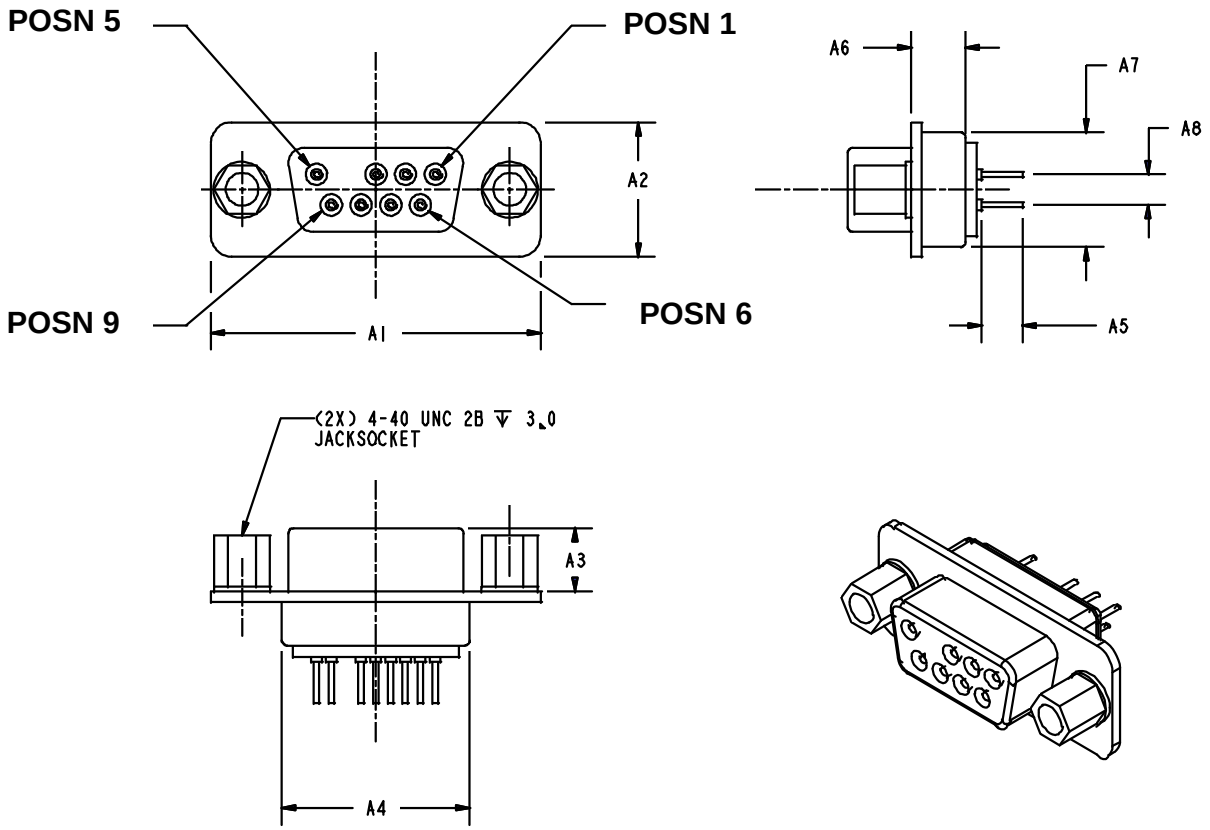


Figure 8 - Fixed board straight through hole (version 2) overview and outline dimensions

A1	A2	A3	A4	A5	A6	A7	A8
30.81	12.55	5.90	19.28	4.32	5.10	10.72	2.84

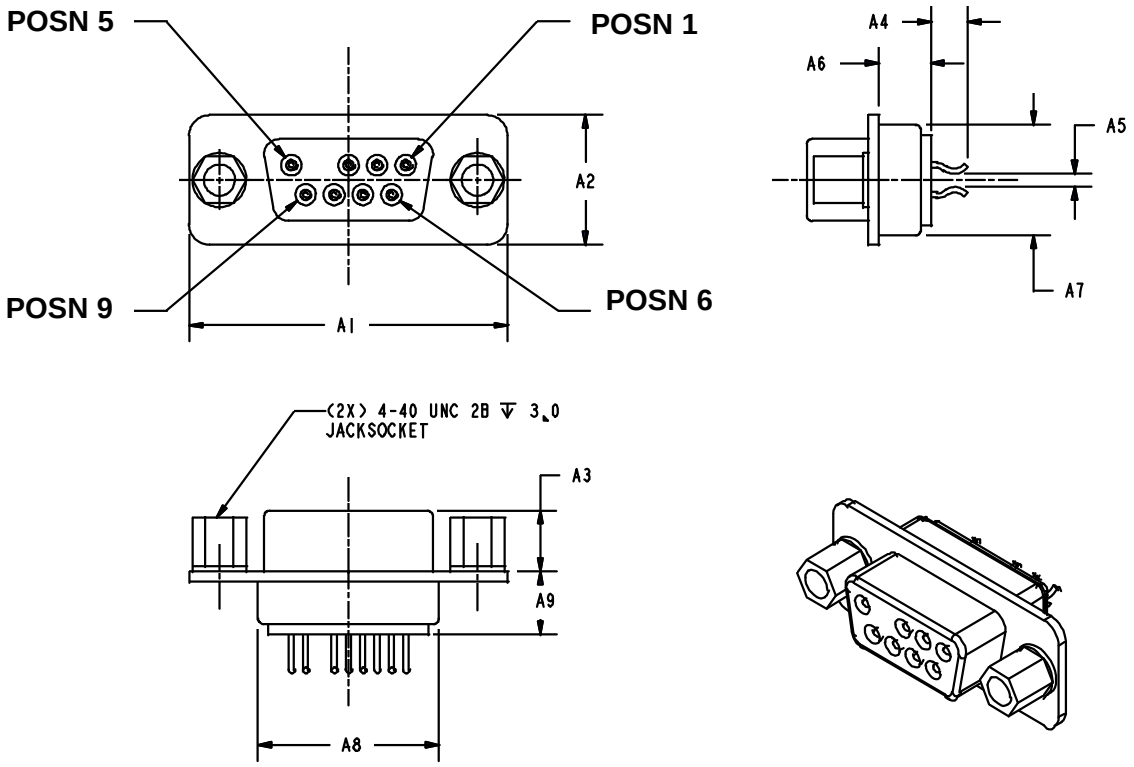


Figure 9 - Fixed board straddle mount overview and outline dimensions

A1	A2	A3	A4	A5	A6	A7	A8	A9
30.81	12.55	5.90	3.40	1.57	5.00	10.72	19.28	6.2

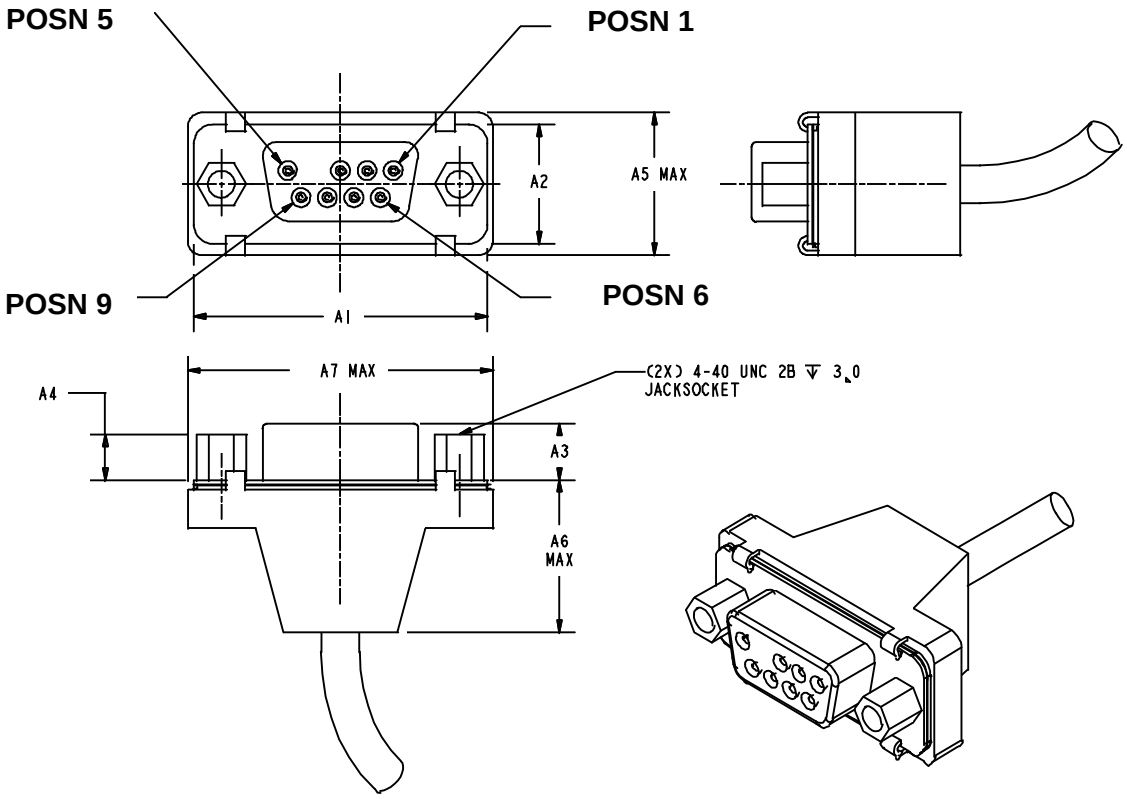


Figure 10 - Fixed cable overview and outline dimensions

A1	A2	A3	A4	A5	A6	A7
30.81	12.55	5.90	4.80	15.75	50.0	33.02

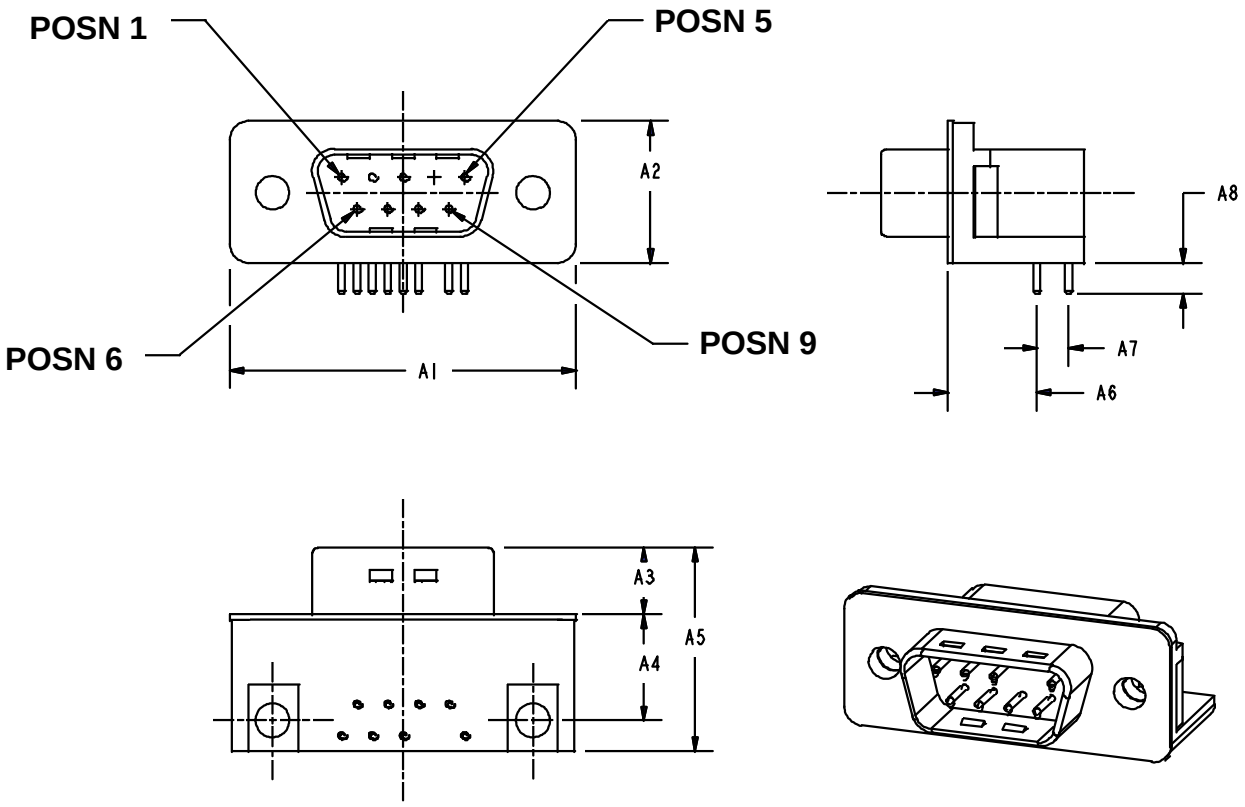


Figure 11 - - Free board right angle thru hole (version 1) overview and outline dimensions

A1	A2	A3	A4	A5	A6	A7	A8
31.21	12.55	6.00	9.53	18.60	8.08	2.84	2.79

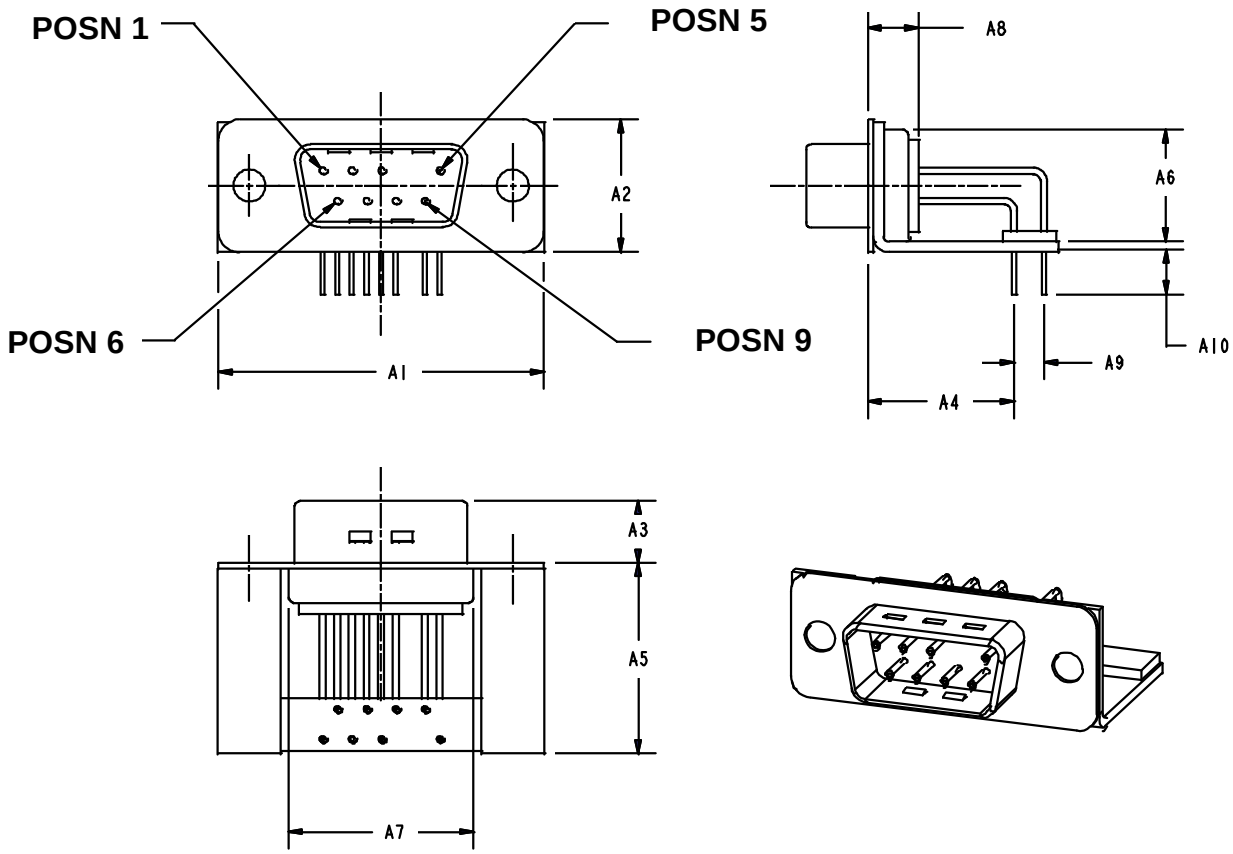


Figure 12 - Free board right angle thru hole (version 2) overview and outline dimensions

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10
30.81	12.55	6.00	13.56	18.00	10.72	19.28	6.2	2.84	4.20

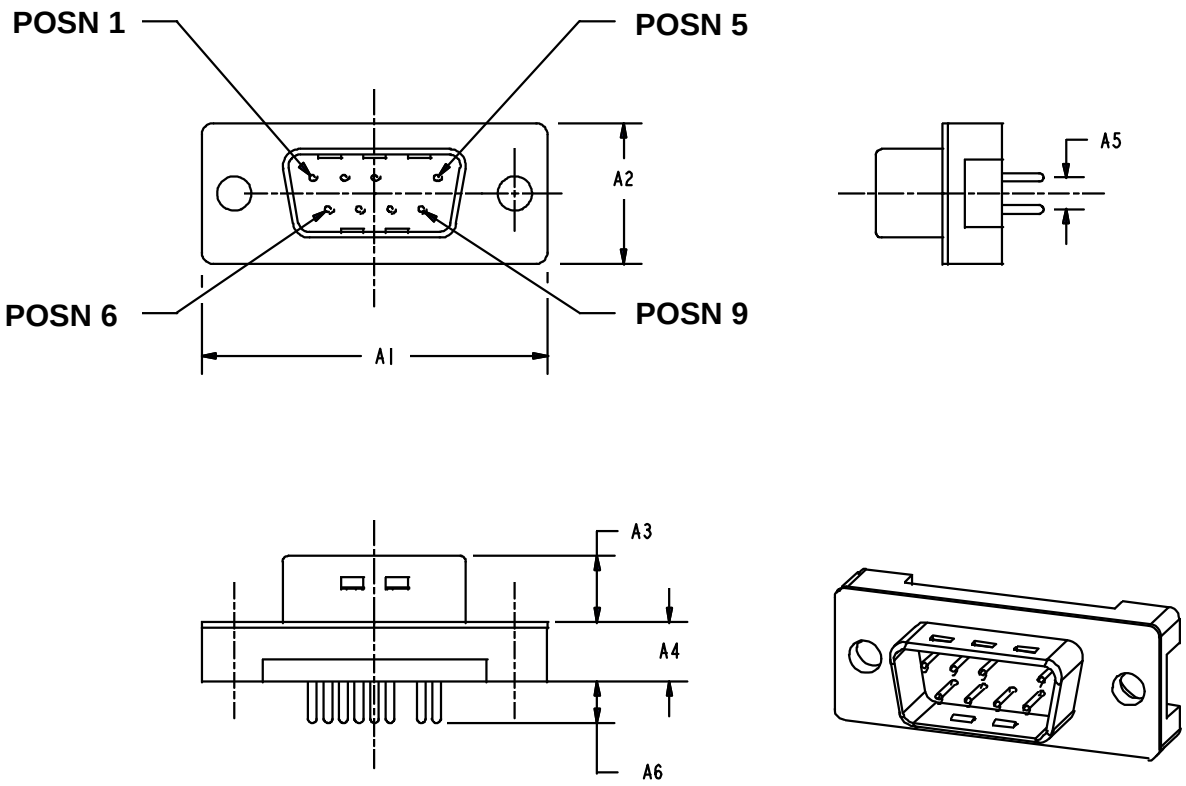


Figure 13 - Free board straight thru hole (version 1) overview and outline dimensions

A1	A2	A3	A4	A5	A6
30.81	12.55	6.00	5.33	2.84	3.70

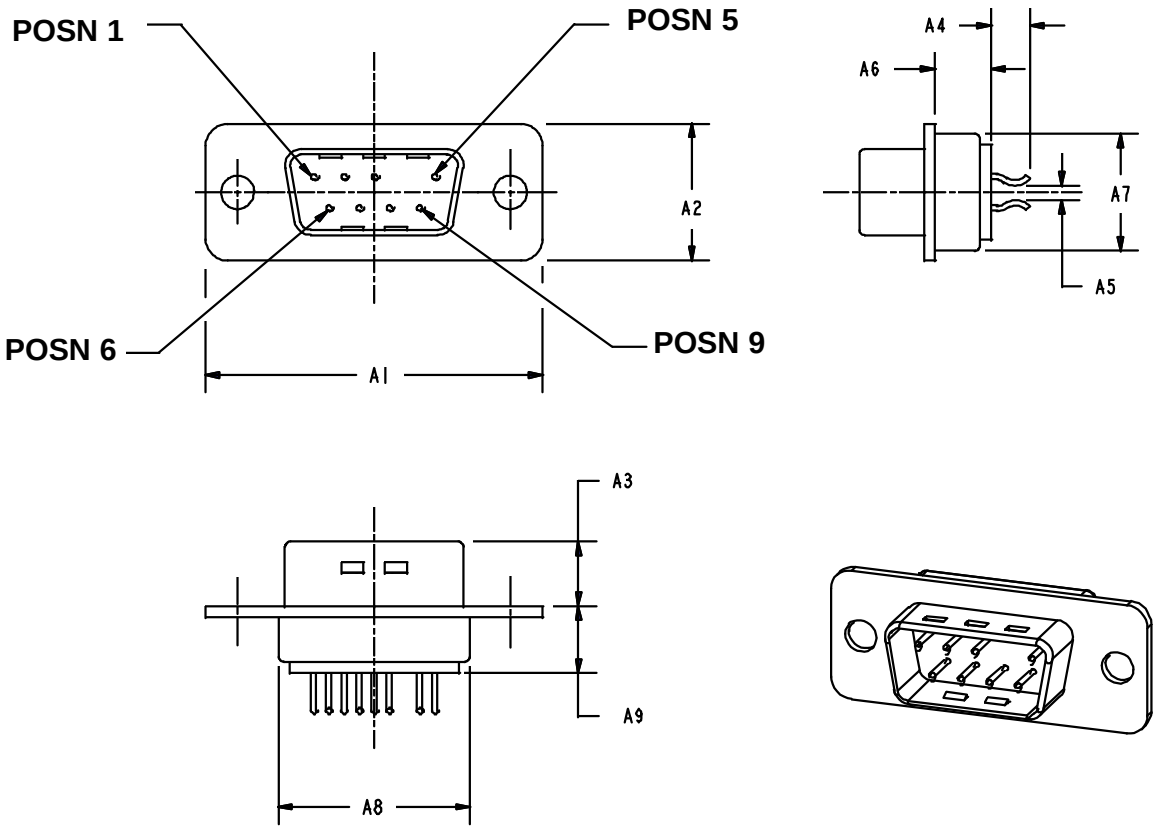


Figure 14 - Free board straddle mount overview and outline dimensions

A1	A2	A3	A4	A5	A6	A7	A8	A9
30.81	12.55	6.00	3.40	1.57	5.00	10.72	19.28	6.2

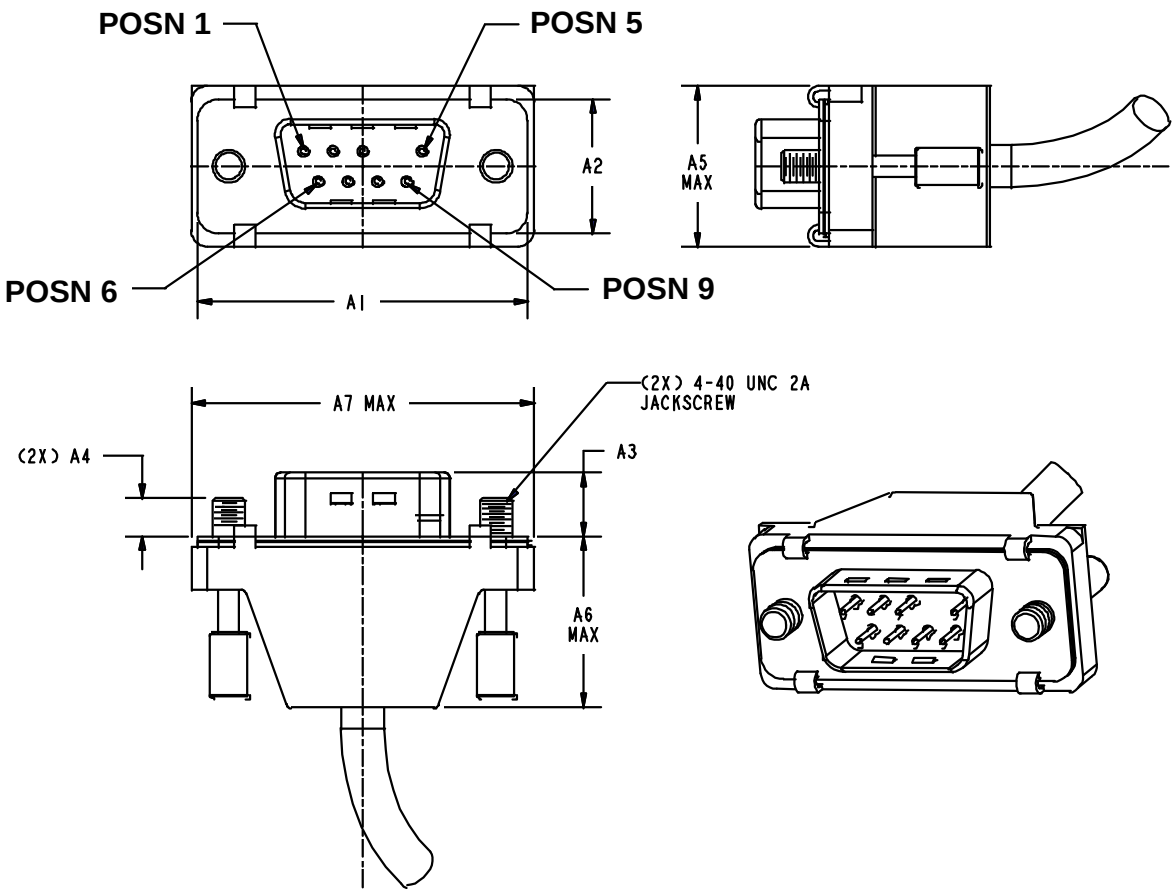


Figure 15 - Free cable overview and outline dimensions

A1	A2	A3	A4	A5	A6	A7
30.81	12.55	6.00	3.56	15.75	50.0	33.02

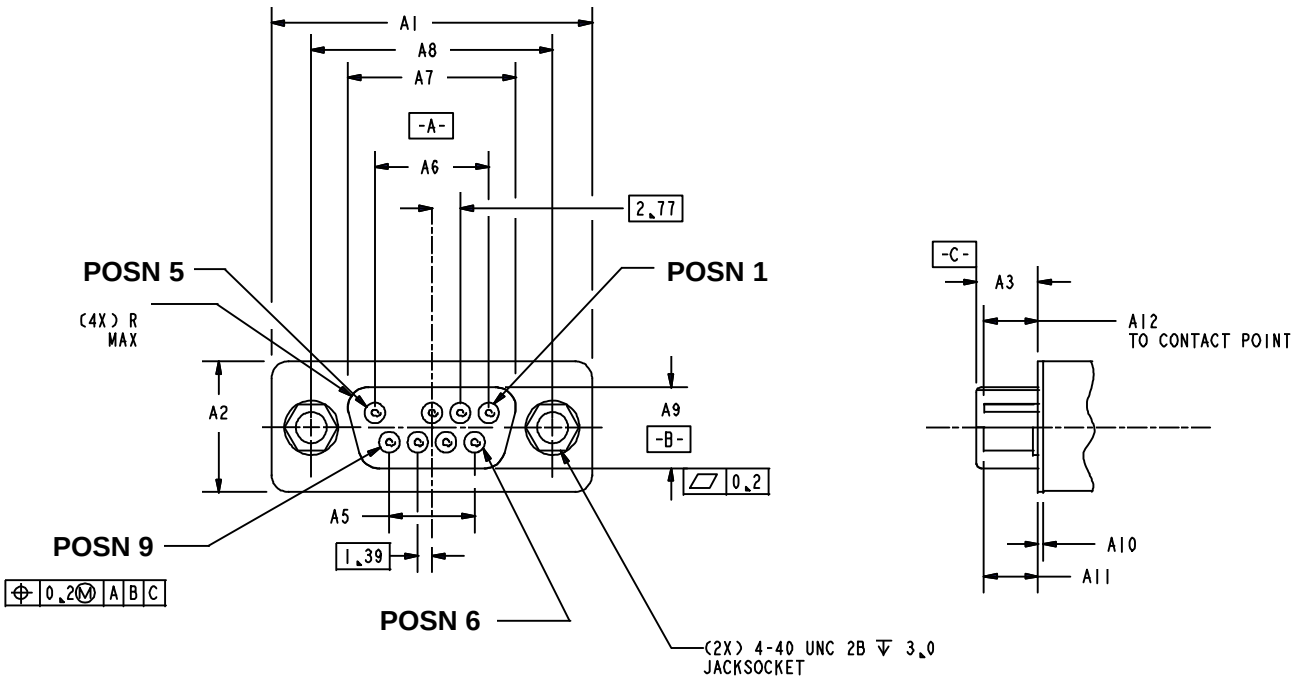


Figure 16 - Fixed mating interface dimensions

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
30.81	12.55	5.90	1.37	8.31	11.08	16.33	24.99	7.90	0.5	5.90	5.89

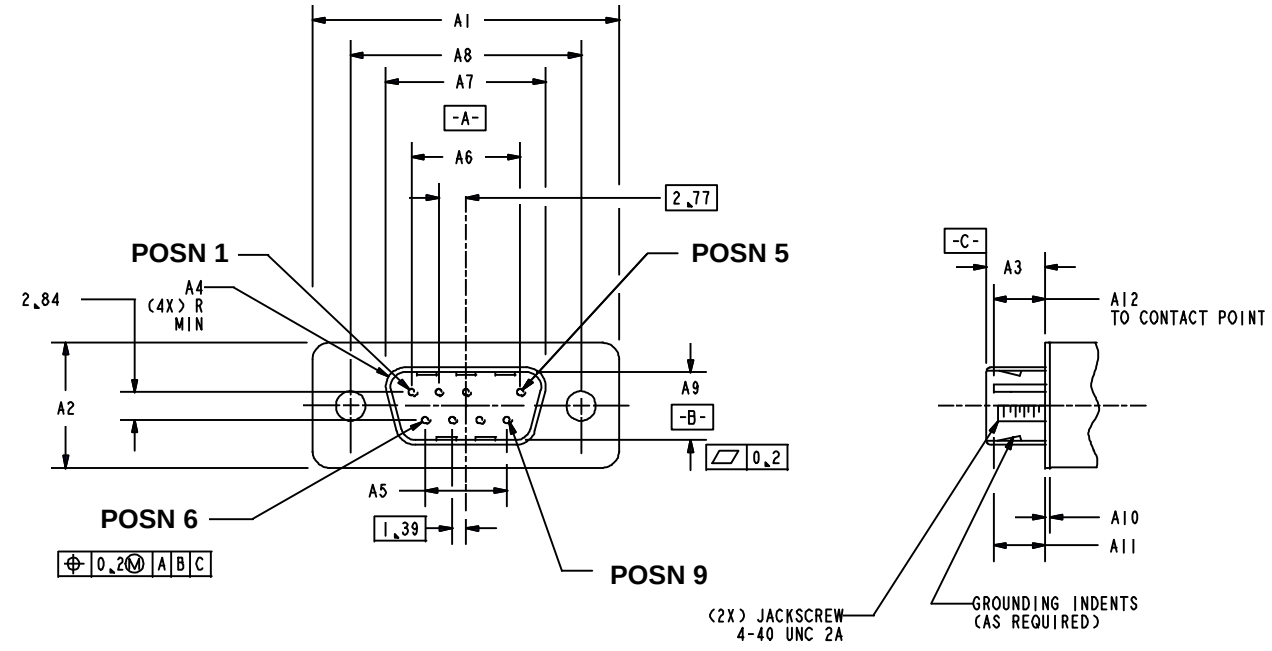


Figure 17 - Free mating interface dimensions

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
30.81	12.55	6.00	1.37	8.31	11.08	16.92	24.99	8.36	0.5	6.0	5.89

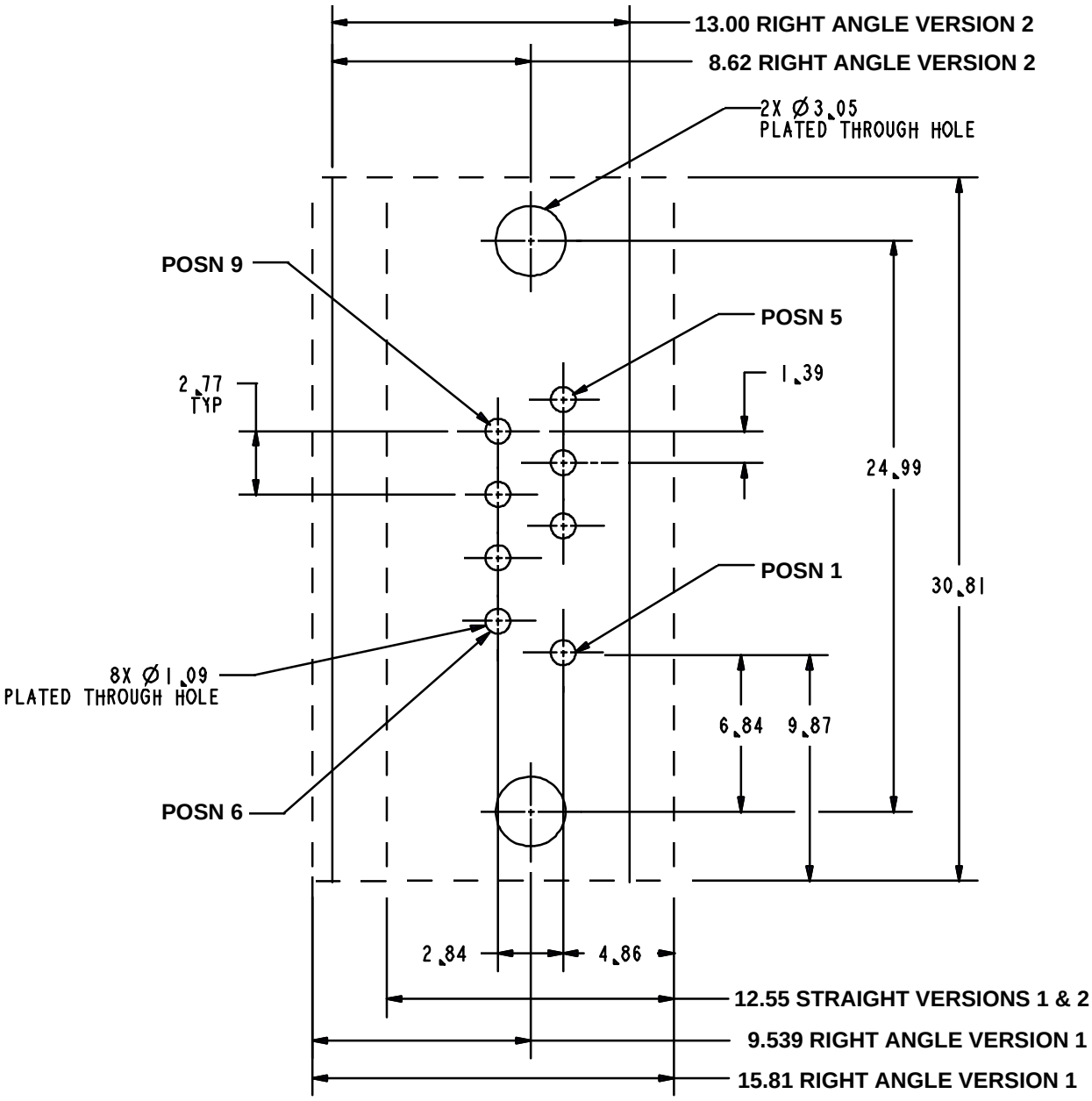


Figure 18 - Footprint for all fixed thru hole versions

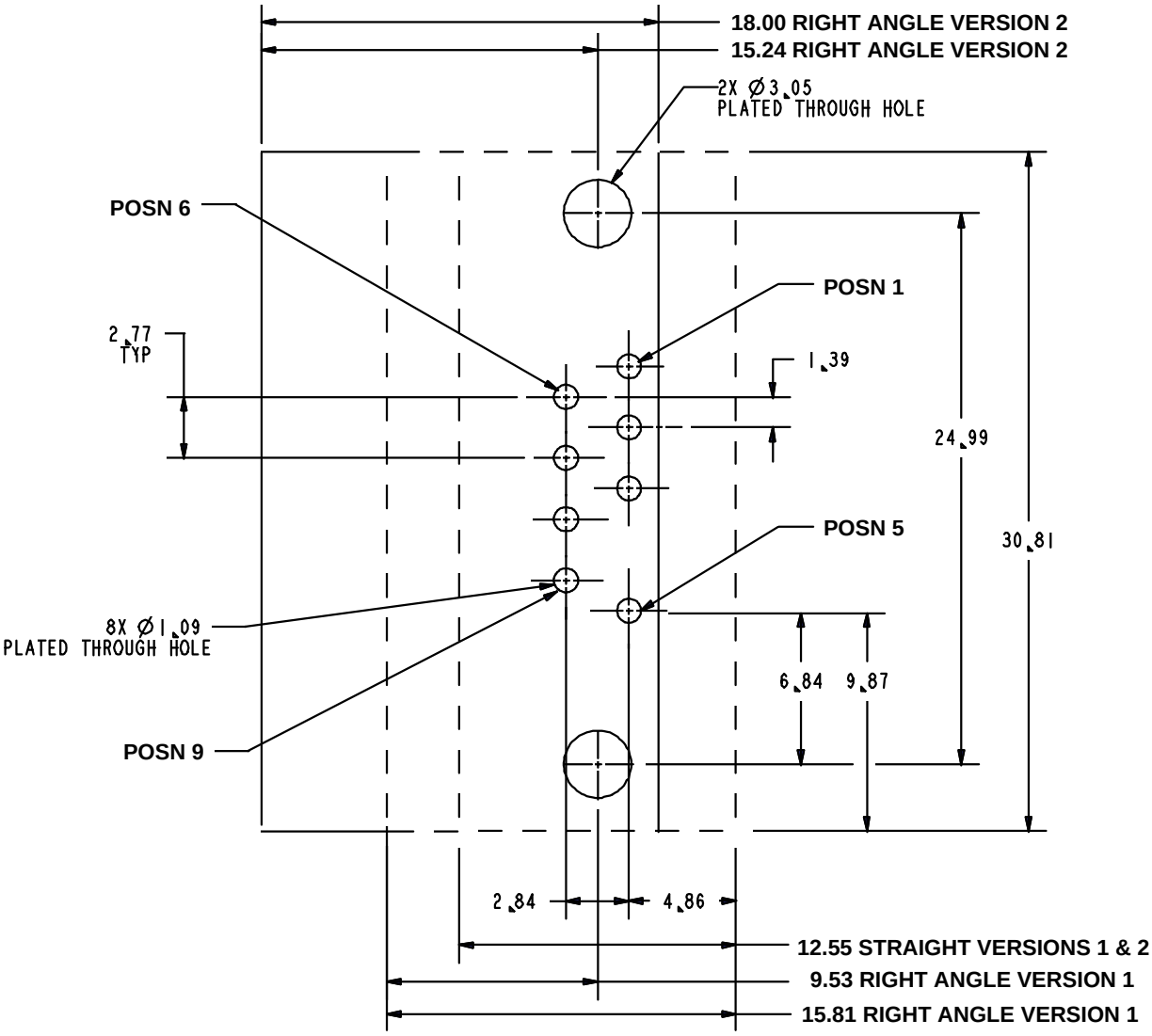
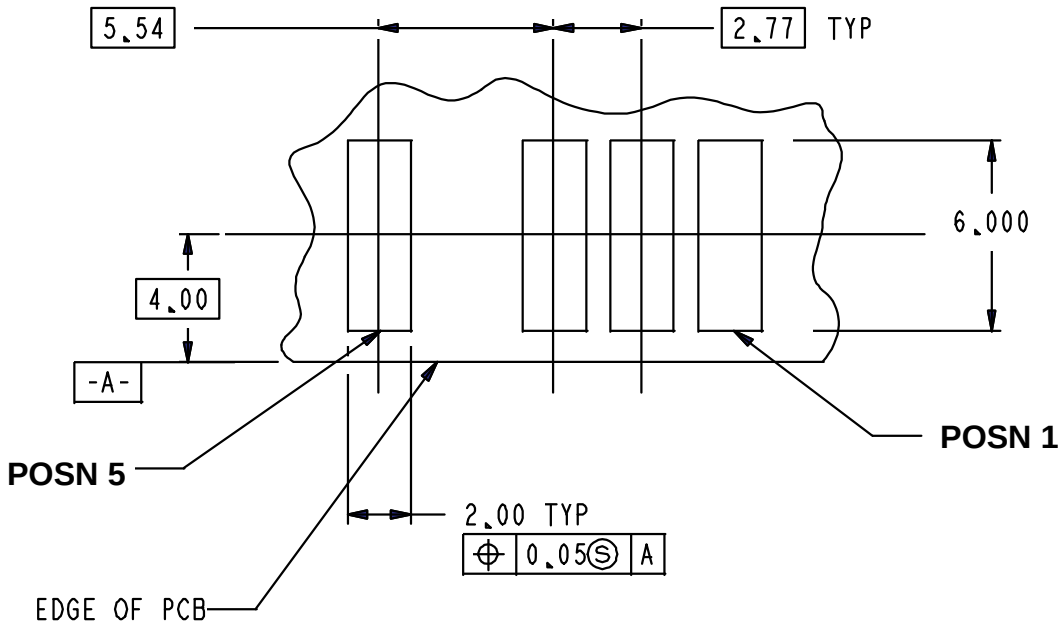


Figure 19 - Footprint for all free thru hole versions



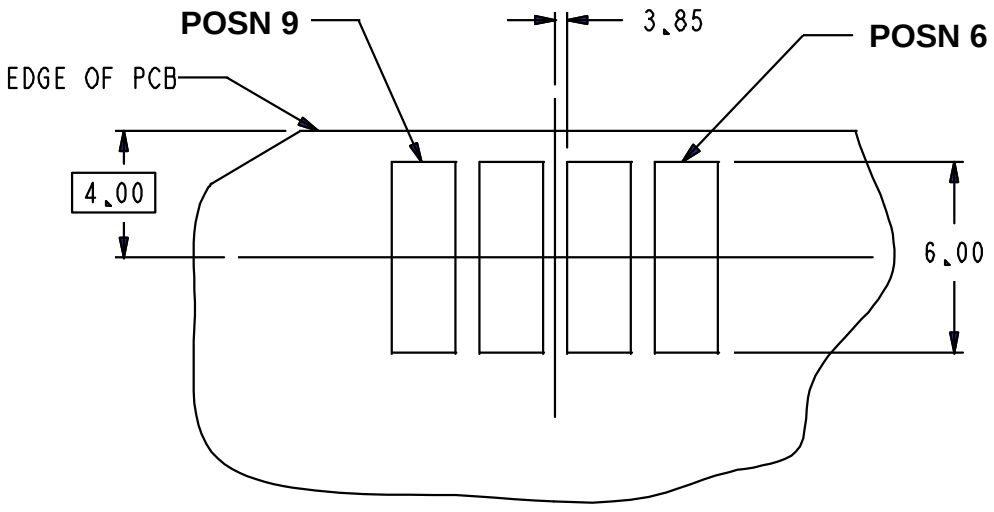
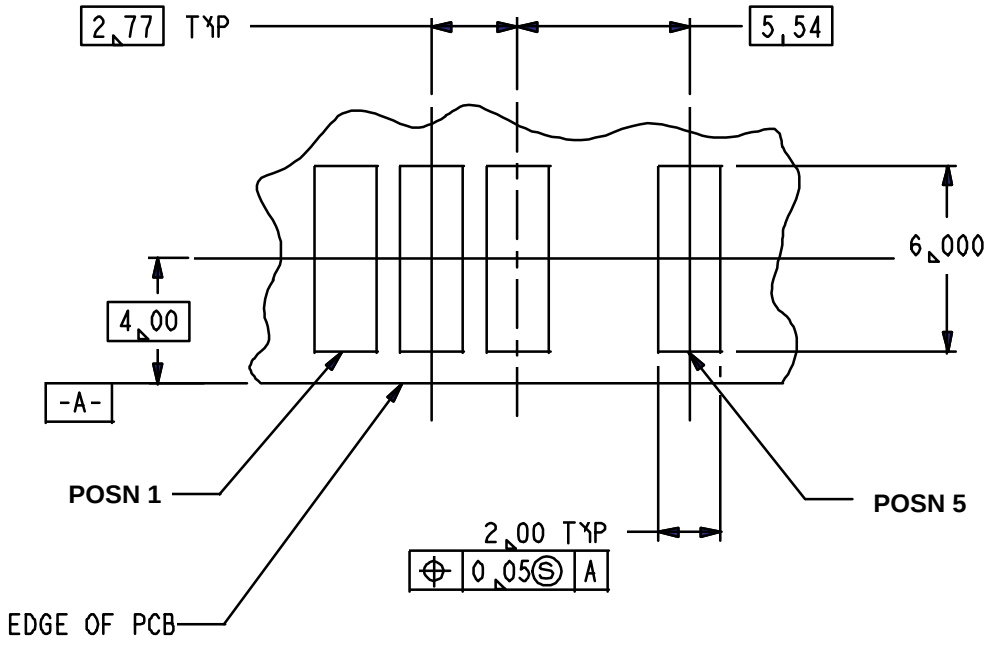


Figure 20 - Fixed board straddle mount footprint



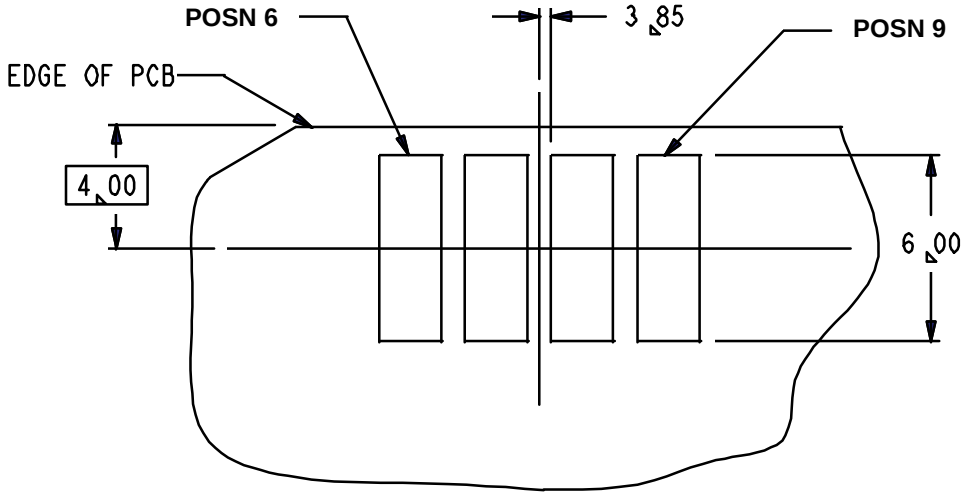
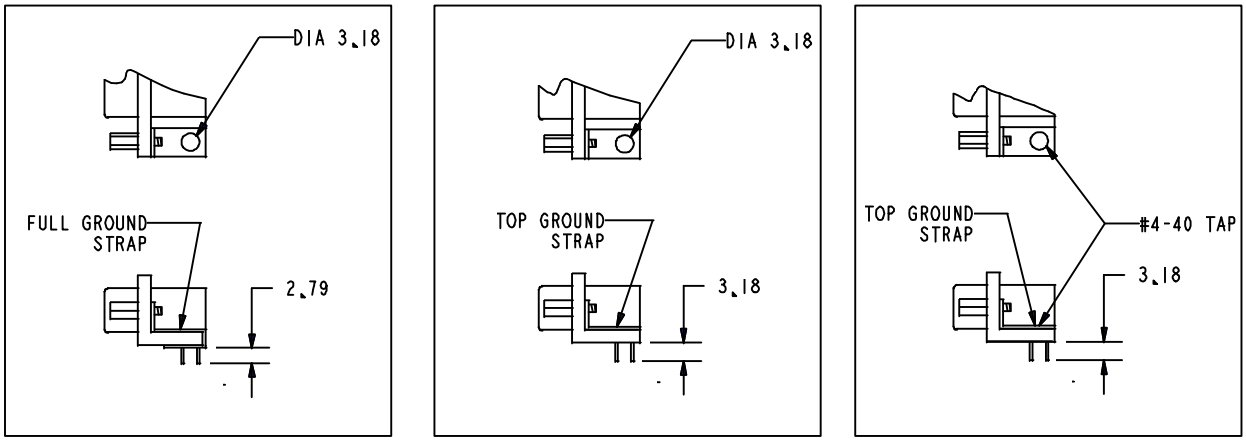
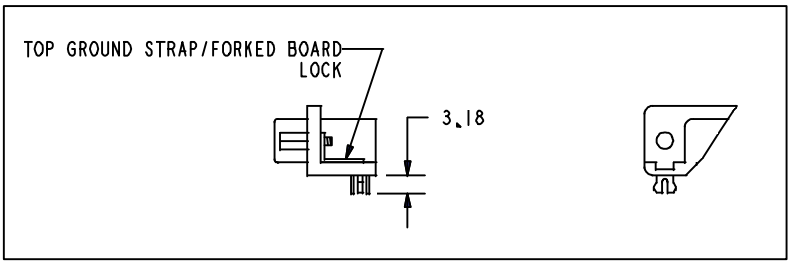


Figure 21 - Free board straddle mount footprint



STYLE 1 **STYLE 2** **STYLE 3**



STYLE 4

Figure 22 - Styles for grounding board mount shells

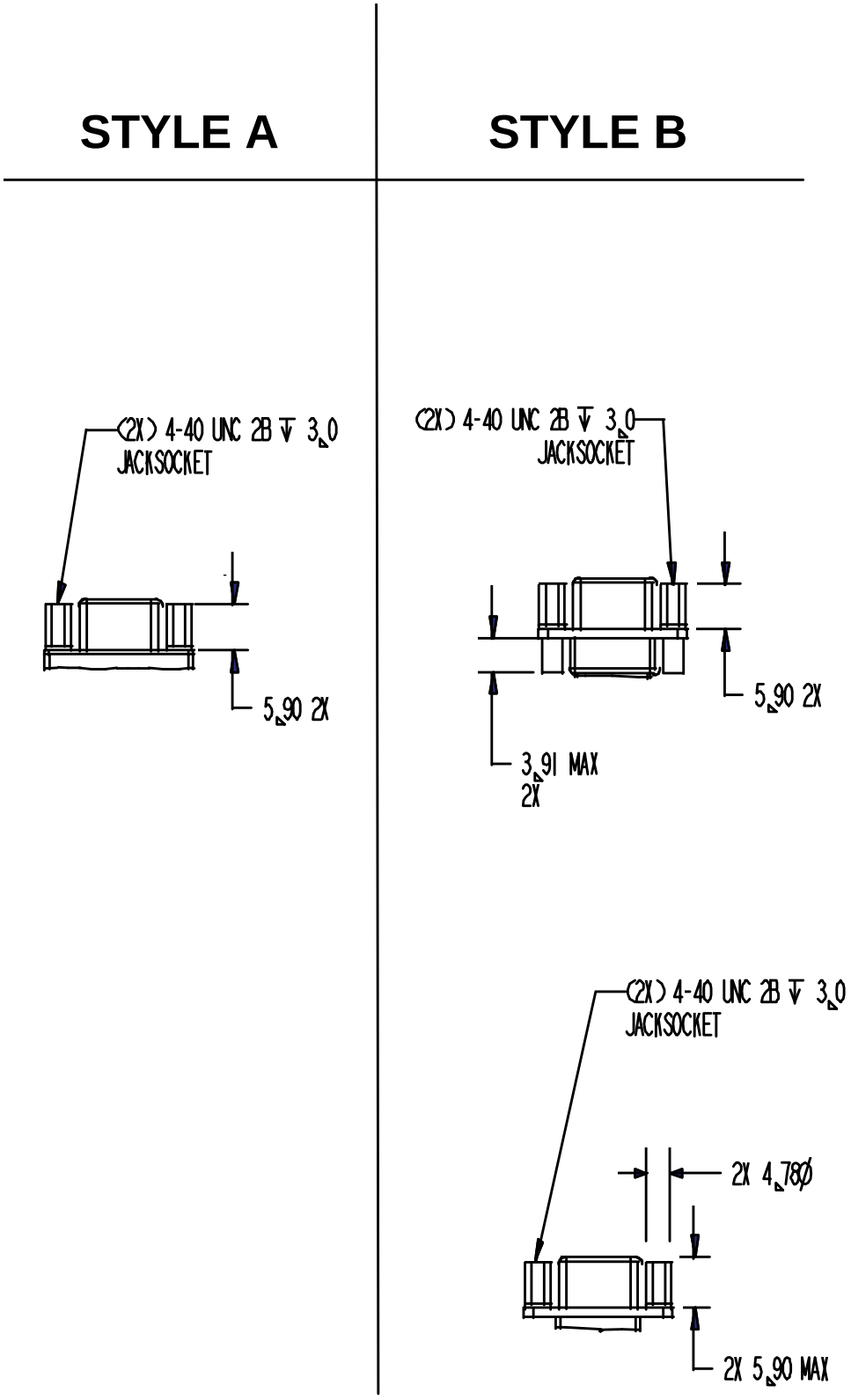


Figure 23 - Bulkhead mounting hardware

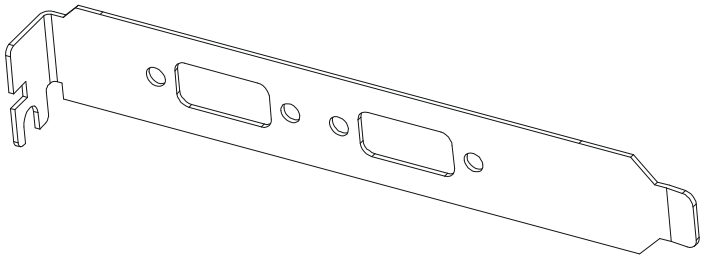


Figure 24 - Overview of dual port DB9 I/O bracket

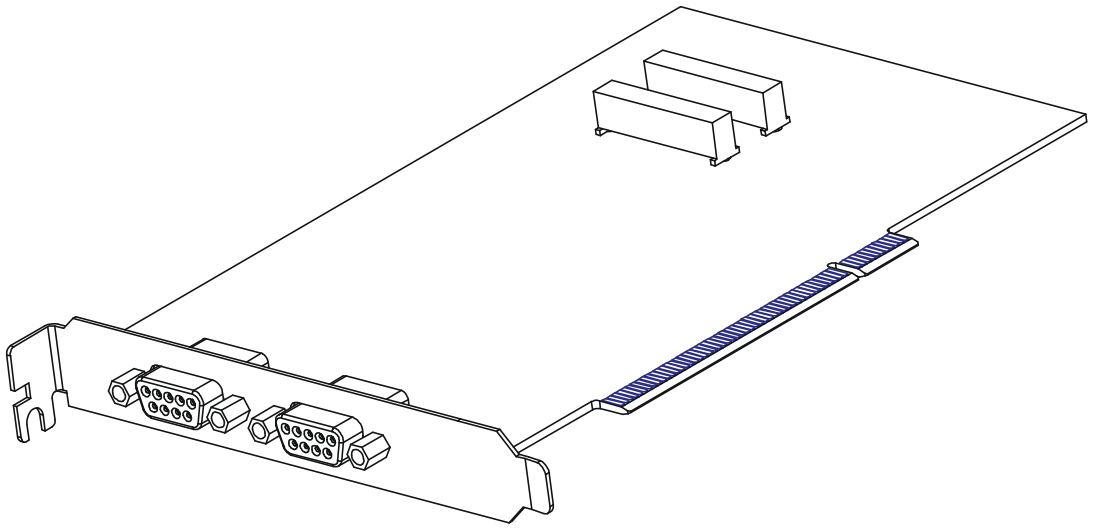


Figure 25 - Dual port DB9 PCI card assembly

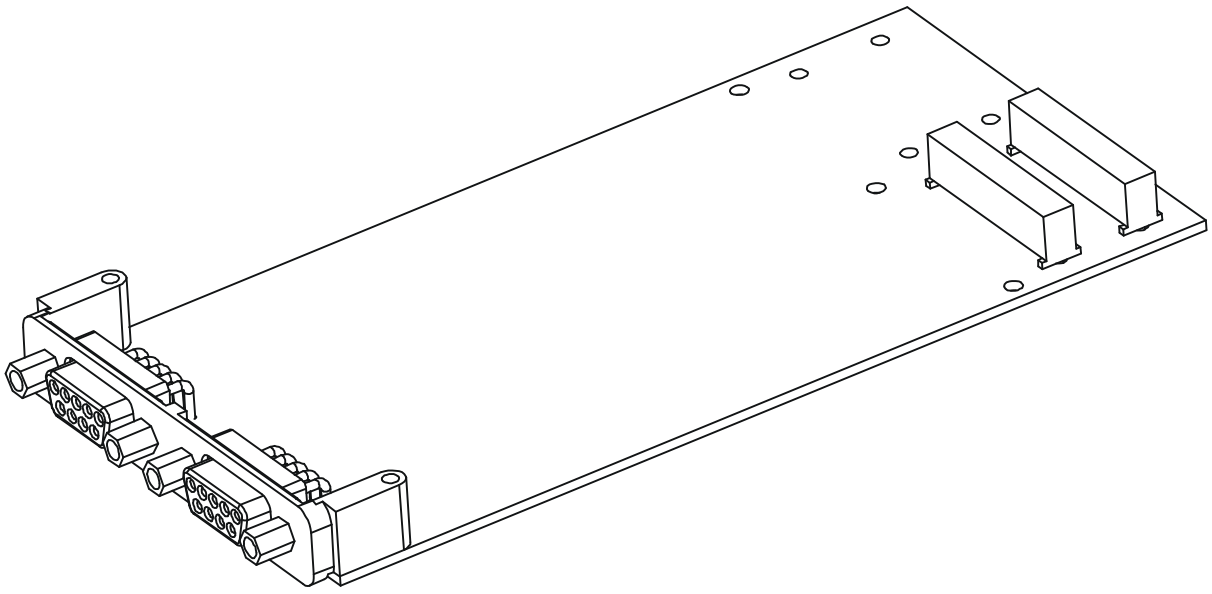


Figure 26 - Dual port DB9 PMC bracket / card assembly

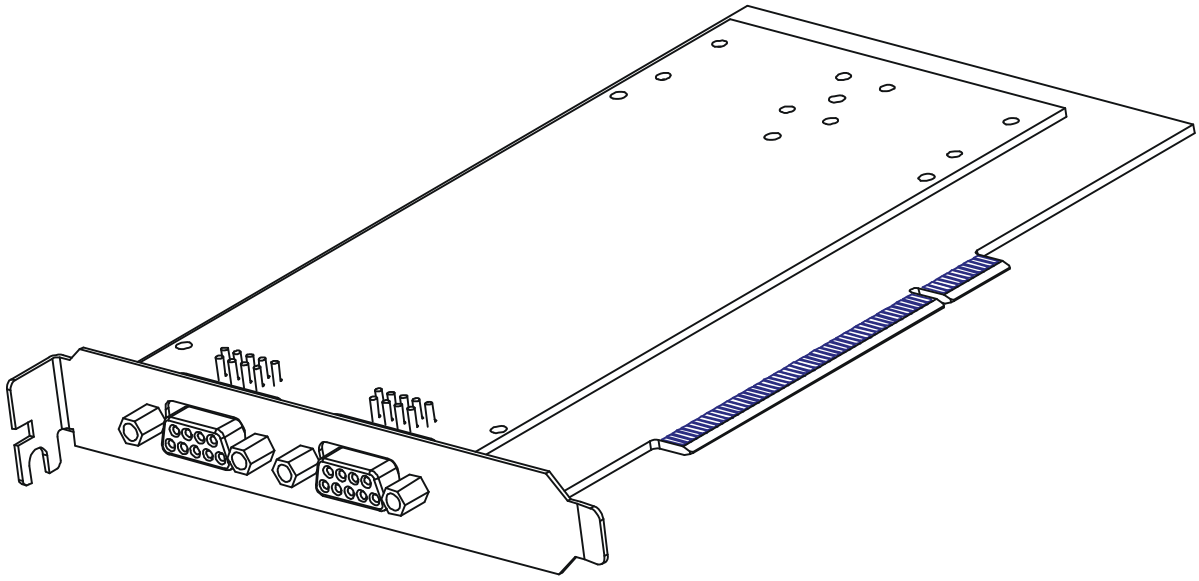


Figure 27 - Dual port PMC mezzanine card on a PCI card assembly

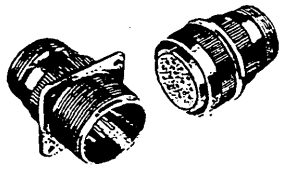
ANNEX A

EIA TERMINOLOGY FOR CONNECTOR GENDER

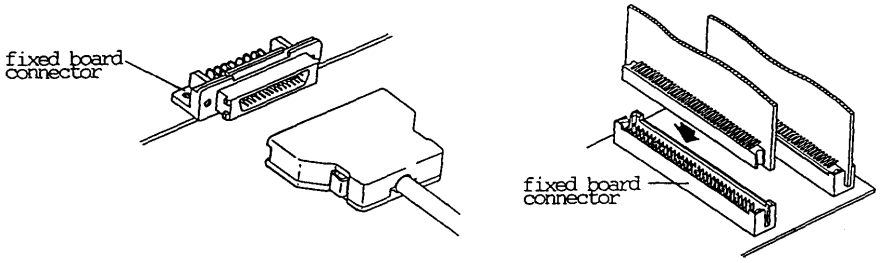
Figure 28 and Figure 29 describe the rationale for the EIA connector gender terminology.

(Expansion Connector)
A connector that provides a flexible connection between a rigid conductor and electrical apparatus.

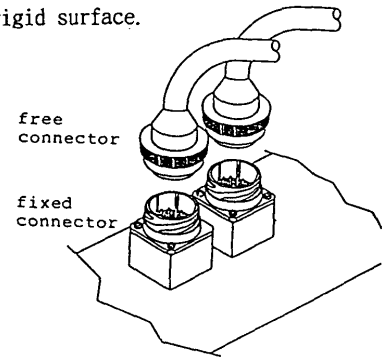
(Fireproof Connector) 581-06-09
A connector capable of withstanding flame of a specified temperature for a specified time.



(Fixed board Connector) 581-06-39
A connector mounted on removal printed board, for engagement with a Free Cable Connector or a Free Board Connector.



(Fixed Connector) 581-06-10
A connector for attachment to a rigid surface.



(Flat Cable Connector)
Connector designed specifically to terminate flat cable. May be designed for flat conductor, flat cable or round conductor flat cable.

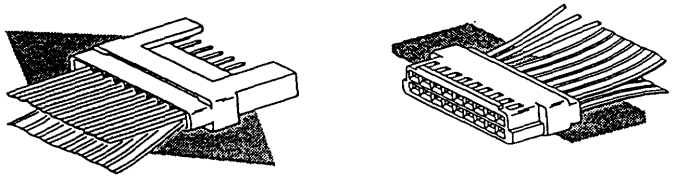
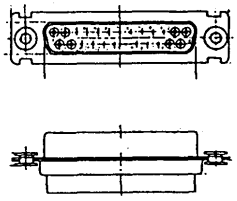
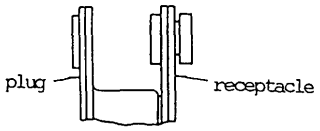


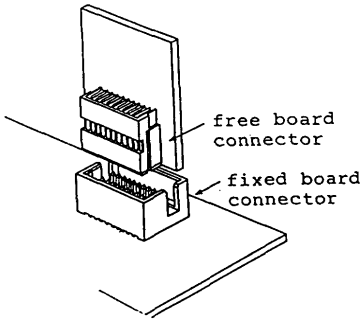
Figure 28 - EIA definitions of free and fixed connectors

(Float Mounting Connector) 581-06-11
A fixed connector with mounting means permitting movement to facilitate align -ment with the mating connector.

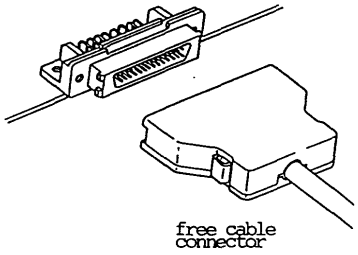




(Free Board Connector) 581-06-40
A connector mounted on a printed board which can be separated from Mother Board or Back Plane.

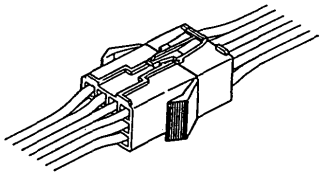


(Free Cable Connector) 581-06-12
A connector for attachment to the free end of a wire or cable.



(Free Coupler Connector) 581-06-13
A connector that mates with a Free Connector in a cable-to-cable appli -cation.

(Free Hanging Connector)
A connector that is movable and not fixed to a board, panel, or frame. It will mate another free-hanging connector or with a panel-mount connector.



(Hermaphroditic Connector) 581-06-14
A connector which mates with an identical connector.

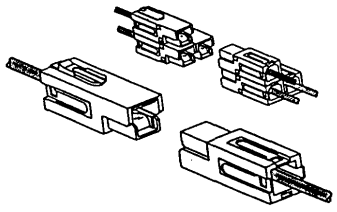


Figure 29 - EIA definitions for connector terminology